SCIENTIFIC AMERICAN

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THE ROWELL AUTOMATIC RAILWAY SAFETY STOP.

It is a well known fact that the majority of railroad accidents, those that cost the companies large amounts of money, are seldom reported in the papers, and these accidents, while not usually attended with loss of life, are a constant drain upon the railroads. One of the leading railroad men in New England recently told us that it was the accidents that the general public did not hear of that cost the companies so much money. The old saying that switches are the bane of a railroad man's life is exemplified in the following list of 70 railroad accidents that have happened within the last six months, compiled from newspaper accounts by a gentleman in Boston, which shows that open and misplaced switches are directly responsible for a large share of these accidents.

Misplaced and open switches	25
Collision of trains	17
Engine running "wild"	4
Fog, could not see signals	6
Snowstorm, could not see signals	1
Open drawbridge	3
"Wild" freight train	1
Not flagged in time	5
Unlocked switch	1
Engineer asleep	3
Paid no attention to signals, Mud Run	1
Drunken engineer	1
Switch tender asleep	1
Failure of brakes to work. (Caused by engineer throwing valve lever too far, thereby releasing brakes after applying them, which could not happen with this device)	1
	70

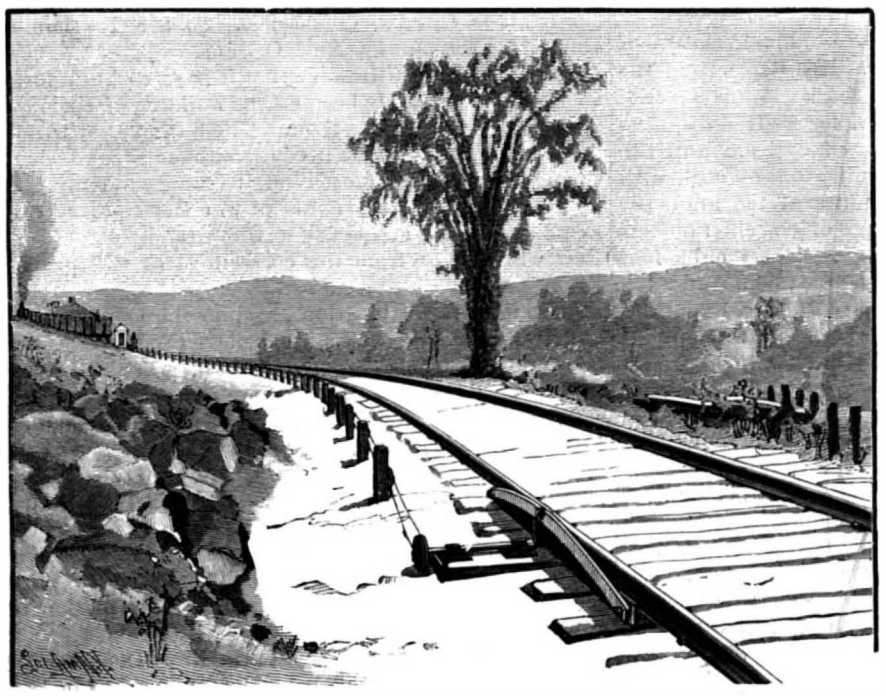

Fig. 3.—OPEN SWITCH—SAFETY STOP IN POSITION.

We had the pleasure of attending a thorough test made of the Rowell safety stop, given at Neponsett, Mass., on April 9. A special train of four cars was run from the Old Colony Depot in Boston, and quite a number of prominent railroad officials were among the guests. Several tests were made, all of which were successful, and conclusively showed that with the safety stop in position it was possible to stop a train running at the rate of 40 miles an hour in less than 500 feet.

In the first test the train was stopped in 380 feet, the engineer not shutting off the steam until the train had almost stopped. The second stop was made in 390 feet; and in the third test, made with all the party on board, the train was stopped within 370 feet, and the shock, though plainly felt, when the brakes were applied by the stop, did not inconvenience any one. All present pronounced it an unqualified success, and tests were also made with the portable form of safety stop, which enables the conductor to absolutely prevent his train from being run into from either direction.

The cuts which we publish in this connection show the applications of the safety stop in various conditions. Fig. 2 shows an open drawbridge. The opening of the draw places the safety stop in position, so it would be impossible for the engine to reach the bridge even if the engineer should be asleep at his post, disabled, or fail to see the signals usually displayed. Fig. 3 shows the manner of application when a switch is open or misplaced. These two illustrations show the safety stop placed permanently in position at what are considered danger points. In Fig. 1 we have an illustration of how this device works on roads where track walkers are constantly employed, and where many accidents happen because the signals are not seen, or, as has happened more than once, the storm has drowned the noise of the torpedoes. A track walker with this device does not have to walk more than 600 or 700 feet, and by placing one of these stops in position at each side of the landslide the place is unapproachable. This can also be applied to grade crossings, so that a train cannot cross the grade when the gates are up, raising and lowering the gates controlling the passage of trains.

Fig. 4 shows the invention attached to the locomotive. It is attached to both sides, and consists of a sliding bar located on the pilot of the engine, connected by a pipe with the power brake, in which is placed a valve directly at top of sliding bar. At the lower end of the sliding bar is placed a friction roller to relieve the blow. The sliding bar is 8 inches outside the rail, and the friction roller is 4 inches above the rail. Beside the track on the sleepers, the proper distance from the rail, 8 inches, to come in line with the sliding bar upon the engine, is an incline composed of two bars of iron, one-half inch by three inches, set edgeways, pivoted at the ends and jointed in the center, one side being slotted to allow it to be raised and lowered. Directly under the center or slotted end is placed a shaft or cam, so that by turning the shaft the bars of iron are raised four inches. At one end of the shaft is placed a wheel, around which a circuit of wire is run to the signal, so that when the signal is turned to danger the shaft is turned in the direction required to raise the incline, which is thus in position to connect with and

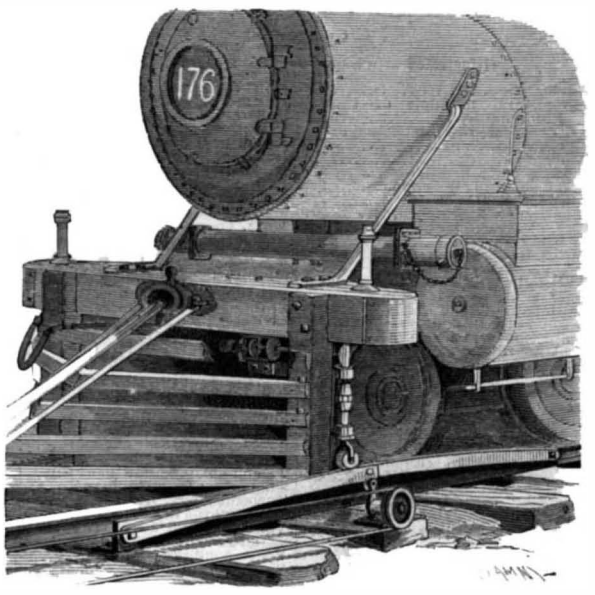

Fig. 4.—DETAILS OF ATTACHMENT TO LOCOMOTIVE, SHOWING MANNER OF STOPPING TRAIN.

force upward the sliding bar on the pilot of the locomotive, thereby opening the brake valve, which sets the air brake. When the signal is dropped to safety, the shaft is turned in the opposite direction, and

(*Continued on page* 294.)

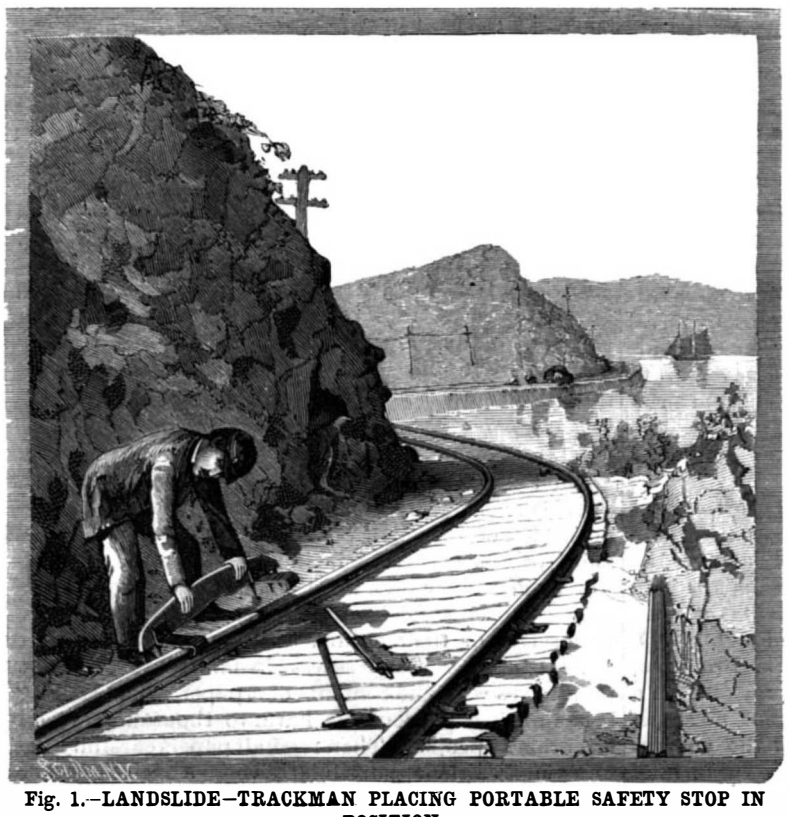

Fig. 1.—LANDSLIDE—TRACKMAN PLACING PORTABLE SAFETY STOP IN POSITION.

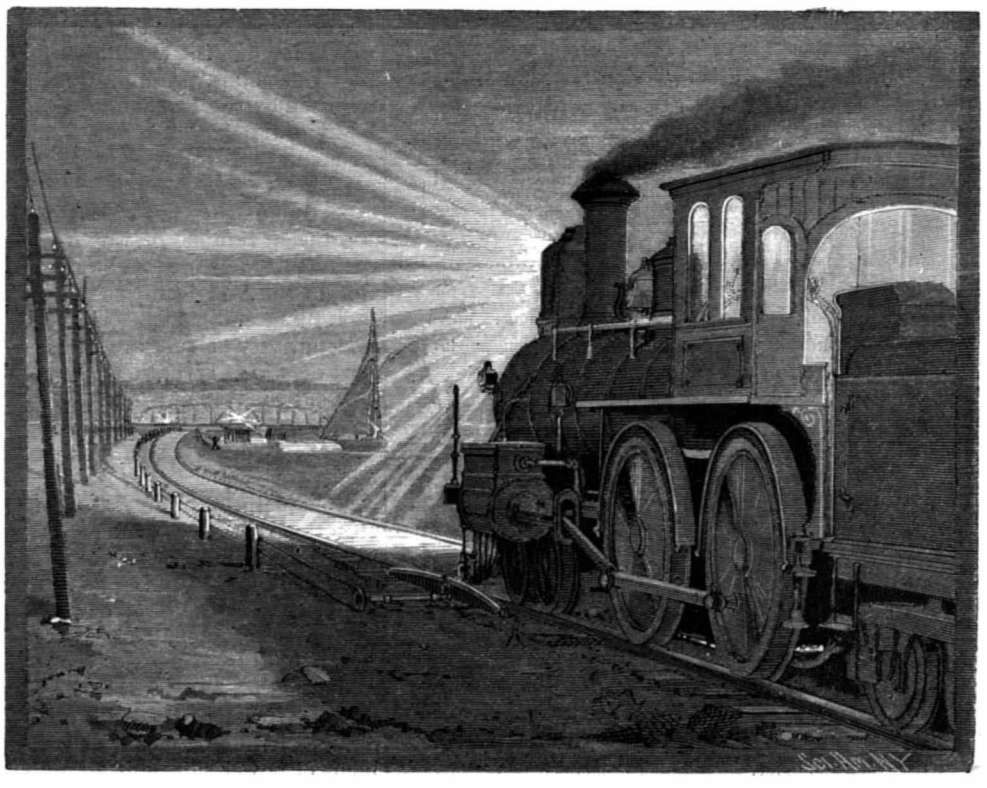

Fig. 2.—OPEN DRAWBRIDGE—SAFETY STOP HOLDING TRAIN.

ROWELL AUTOMATIC RAILWAY SAFETY STOP.

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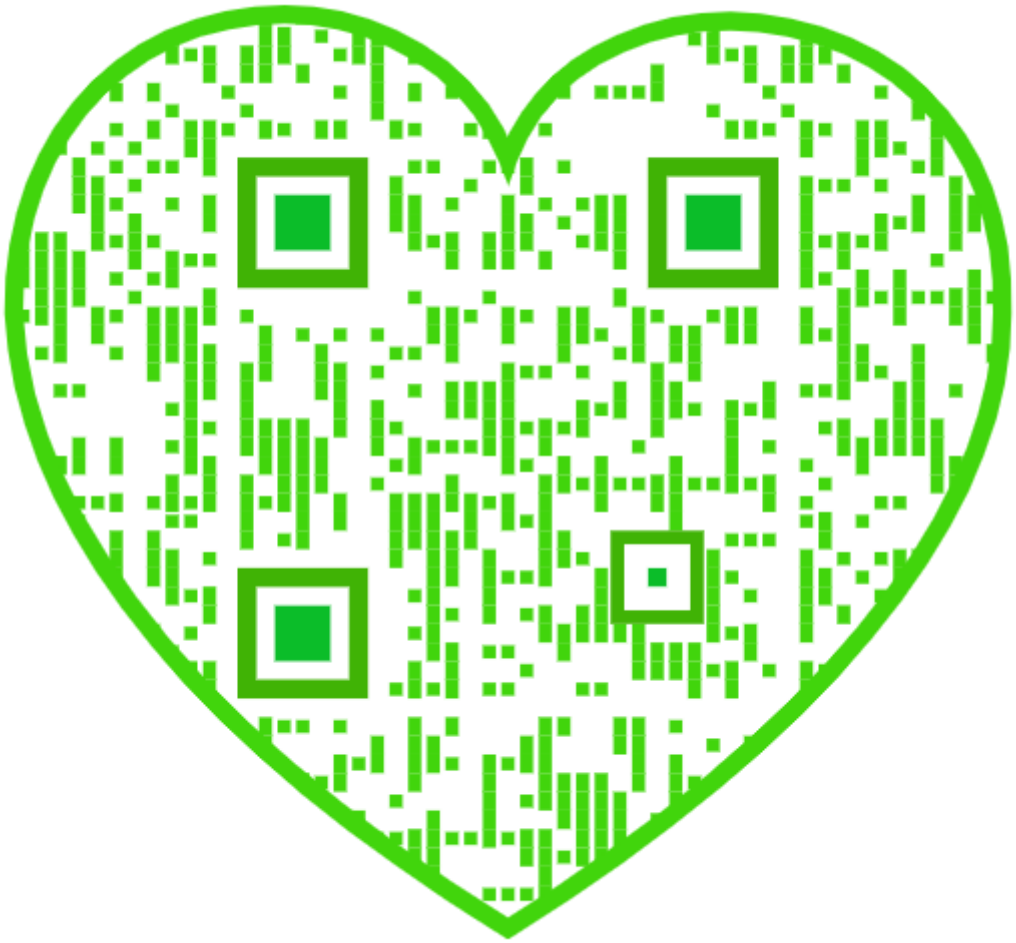

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TORPEDO BOATS.

One of the most satisfactory of the new additions to the United States navy is the torpedo boat Cushing, of which a full description, with illustrations, was given in the SCIENTIFIC AMERICAN of February 1 last.

This boat lately sailed from Rhode Island, where she was built, to Washington. The little ship is satisfactory as a first example, and shows that the government can, and has, after long trial, produced one torpedo boat that is nearly up to the best standards of its class. Other governments have scores of torpedo boats. The United States has now built one. The ice is broken. Let us hope that hundreds of others, even better than the Cushing, will soon be constructed. They are wanted in all our harbors to assist defense.

The Cushing lately sailed from Newport to New York, driven at the highest speed they could get from her, and made the voyage in three minutes less than seven hours, at an average velocity of 19¼ knots per hour. This is superior performance, and indicates an excellence of construction in the mechanism and vessel that is very promising for the future.

On her trial trip she developed 22½ knots per hour. The contract called for 22 knots for three hours.

The Cushing is 138 feet long over all, and she draws five feet three inches of water. Her depth from the crown of the deck amidships to the keelson is ten feet, and her breadth of beam fifteen feet. Her displacement when loaded with ten tons of coal amounted to 117 tons. She can carry thirty-nine tons of coal, with which she could steam 3,000 miles at ten knots per hour. Economy of space was one of the chief objects in view on the part of her builders. Every cubic foot is utilized. She has eleven compartments and ten water-tight bulkheads. There are no doors connecting the compartments. The lower decks fore and aft are entered only by hatchways. She has fuel bunkers all along her sides, abreast of her engines. Her only other protection is her pumping machinery. She can pump 100 tons of water in seven minutes, 870 tons per hour, and her own weight in less than ten minutes. If she should have a shot hole nine inches in diameter through her engine room compartment, her pumping capacity would enable her to keep free from water.

When equipped, she will carry a torpedo tube on each bow and a torpedo gun amidships, and will thus be able to launch three torpedoes at once. She will carry five rapid-fire one-pounder cannons, and will have a search light.

She is built with twin screws and quadruple expansion engines. There are more than three miles of tubes in her boiler and more than one mile in her condenser. It is estimated that on her official trial trip she developed more than 1,700 horse power. The diameter of her turning circle is only 250 feet. She can be propelled astern as well as forward, and has made over seventeen miles an hour while going in that way. The tubular boilers of the Cushing are of English design, such as are used in the fastest British torpedo boats.

The success of the Cushing and her presence in Washington, where members of Congress can witness her maneuvers, will, we hope, lead them to authorize the construction without delay of a better and faster class, such, for example, as the flock of torpedo boats possessed by the Italian government, among which are the Aquila, Sparviero, Nibbio, Falko, Aoltoio, etc. These boats are 13 feet longer than the Cushing and have a little greater engine power. On their three hours' trials three of them developed respectively 26·2, 26·6, 26·8 knots, the fastest being over 4 knots quicker than the Cushing. During some of the trials a speed at the rate of 28 knots per hour was attained. The Italian navy has several torpedo boats of smaller dimensions than the Cushing, some of which run at 22½ knots per hour. A guaranteed speed of 26½ knots is required by the Russian government for torpedo boats lately ordered. These fast boats are built at Elbing, Prussia.

SHIPS AND GUNS NEEDED FOR DEFENSE.

A recent number of the New York *Herald* gives at considerable length a showing of the insecure condition of the American coast cities in respect to naval attack by foreign enemies. Reports of opinions by naval and military officers are also given, the general purport of which is that at present, and for many years to come at the rate of progress now being made, our principal seaport cities are likely to remain exposed to easy capture by any determined enemy having under its control a few superior vessels of war. The *Herald* gives a pictorial representation showing the helpless situation the city of New York would be in, supposing a hostile fleet should approach only as near the metropolis as Flushing Bay, 8½ miles from the City Hall and Post Office. The picture represents the ruins of the government edifice, as a result of a hit by a single shell from a great gun. New York, Brooklyn, and adjacent cities would be at the mercy of such a fleet. At present there are no forts, no guns, no ships, and few available means at command of the government of power sufficient to prevent the coming in of hostile war ships to the position mentioned. What is true of New York is equally true of all the principal cities on our seaboard. Portland, Me., with its splendid harbor, would be an easy prey to an enemy. Modern war ships might lie at anchor, out of range of the present old guns and fortifications, and shell all parts of the city.

Portland is the strategic key to the military occupation of all Maine and the greater part of New Hampshire, and is necessary as a winter port to the Province of Quebec. Between hostile powers, whichever one has Portland has practically all the country between the lower St. Lawrence and the Atlantic seaboard east of Portland as tributary dependencies.

In case of war between the United States and Great Britain, the capture of this city would be among the first achievements aimed at. Its capture would put the invaders effectually in possession of the whole territory, to use as a base of operations and supplies.

In the present state of its defenses Portland could easily be captured by an invasion from the sea, but could never be recaptured by forces from the land. The loss of this portion would be well nigh fatal to American supremacy in New England, for with the fall of Portland would fall in due time Boston also.

Boston is equally defenseless. So are Baltimore Charleston, Savannah, New Orleans.

Colonel J. A. Smith holds that it pays to build forts we do not use, simply because the building of them removes the need to use them. The nation that is not defended is the one that needs defenses most, and when the need arises, it is most likely to come suddenly. If by building forts and ships of war the country can avoid a war, the money that they cost is well spent. Few will dissent from the correctness of this proposition.

As to modern fortifications, such as the construction of first-class steel defenses, we believe Congress has so far done nothing. Bnt in respect to war ships some progress has been made. We have now in the Mediterranean a fleet of four steamers, not very fast and not formidable, but still creditable ships. Three other better vessels are nearly ready, and a few on the stocks. The strongest fighter of these—the Texas—built on English plans, it was found, after construction was well begun, would probably not float, owing to excessive weight, and work was stopped. But the most recent conclusion is that she will float, and her completion is advised.

The Board of Bureau Chiefs of the Navy Department have finally recommended a few minor changes in the plans of the vessel, but, on the whole, have made no material reduction in the weights, thus practically acknowledging that the original calculations were correct. The principal changes made are in the location of the heavy guns and a reduction of the space for stores. As originally designed, the guns were raised only eighteen inches above the decks. On account of the liability of injury to the deck when these great guns are fired, the board concluded to raise them to three feet above the deck. It the end it may be found desirable to reduce by an inch or so the thickness of her armor, so as to provide more stores and more men. The work of construction can continue, however, without further delay.

Future of the Electric Motor.

Joseph Wetzler, in his article in *Scribner's* on the "Electric Railway of To-day," concludes by making the following prediction: "With the advantages of the electric railway so clearly pointed out, and so unquestionably demonstrated in actual practice, it would not be unsafe to hazard the opinion that, in ten years, at the farthest, there will not be a horse railway in operation, at least in our own country. The horse will then be once more returned to his legitimate field of labor, and the street car passenger will be transported at an increased speed, and with all the comforts of easy riding, in cars propelled and lighted by electricity; while it is by no means improbable that, with further work on the line indicated, the passenger may step aboard a train in New York at ten in the morning and eat a five o'clock dinner in Chicago on the same day. Enough has indeed been accomplished to show that electricity is destined to be one of the most powerful factors entering into our social conditions, and that the ease of distribution and convenience of power afforded by it must bring forth changes in the social order which are even now hardly realized."

Good Advice.

Don't sign, says a contemporary. But such a caution as this seems hardly necessary to any person in the full possession of his faculties. Yet it is astonishing how many people there are, including good business men, who attach their signature to papers or documents whose contents might have a serious bearing upon themselves or their affairs, with scarcely a glance at their contents. Carelessness in failing to acquaint themselves with the contents of a paper before signing it has worked incalculable harm to thousands of well intentioned people. Then read all papers carefully before you sign them, particularly those that express or imply anything in the nature of a contract or a legal obligation.

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New Mode of Mounting Guns.

A successful trial of Sir W. G. Armstrong, Mitchell & Co.'s new mode of mounting guns to be fired *en barbette* recently took place off the Isle of Wight, on board her Majesty's screw gunboat Handy, a vessel specially appropriated for gun trials. Particular importance attached to the proceedings on this occasion, the invention to be tested being designed to meet a defect which has been much felt in regard to the existing method of mounting heavy guns in barbette ships. Several novel features are found in the principal design, the total result being practically a new departture in naval gunnery. The gun not only returns automatically into the firing position after each discharge according to the Vavasseur recoil system, but is capable of being elevated so as to fire at angles up to 40°, or double that allowed by any previous mounting for such a gun, the caliber of the piece in this instance being 9·2 inches, and the weight 22 tons. The carriage on which the gun is mounted is also fitted with a steel shield, 6 inches thick, which is attached to the mounting and trains with it. The construction is such that the port through which the gun fires is completely filled by the gun at all angles of elevation, thus preventing the entry of projectiles or splinters. The mounting is intended for use in barbette batteries on the upper deck, and no similar carriage has hitherto been provided with any shield or screen capable of resisting the fire of anything more than machine guns, whereas the shield now devised will effectually protect the gun and gunners from all rapid-firing guns at present in use in the service. The elevated fire is valuable as affording the means of attacking coast batteries placed on high ground at short range. At present, elevated land batteries protecting a narrow passage or harbor can fire down on ships attempting to pass them without being open to attack themselves. At the trial which took place on March 29, fifteen rounds were fired at angles ranging up to the maximum of 40 degrees with perfect success in every respect.

Specimens of the Coco-de-mer.

Two specimens of Gordon's "forbidden fruit," the curious double cocoanut of the Seychelles, were brought to the Pall Mall *Budget* office a few days ago by Mr. J. Troubridge Critchell, who had just received the nuts from the Mauritius. The fruit of the coco-de-mer has a peculiar interest to the many admirers of the late General Gordon, who firmly held to the idea that the Seychelles were the Garden of Eden, and that this unique vegetable growth was the cause of the world's depravity, against which Gordon fought so bravely. The nut weighs twenty pounds, and measures twenty-five inches across. The palm on which it grows (*Lodoicea Seychellarum*) is one hundred feet in height, and is only to be found on this tiny group of islands. Hundreds of years before the Seychelles were discovered, these nuts were washed up on the Maldive Islands, and the wiseacres of those days told the people that this seaborne fruit had grown on a submarine tree, and that it had a mysterious power of counteracting poisons. Hence the name—coco-de-mer. It is probable that Gordon met with allusions to this wonderful nut in Arabic MSS., and afterward visiting the Seychelles, was struck by the beautiful and isolated group of islands and their double cocoanuts.

Tuberculosis in Sleeping Cars.

The plush, velvet, and silk hangings must go. Seats must be covered with smooth leather that can be washed off, carpets give place to rugs, to be shaken in the open air at the end of every trip—better still, abolished for hardwood floors; the curtain abomination must make way for screens of wood or leather, the blankets of invalids' beds be subjected to steam at a high temperature, mattresses covered with oiled silk, or rubber cloth that may be washed off, and, above all things, invalids provided with separate compartments shut off from the rest of the car, with the same care which is taken to exclude the far less offensive or dangerous smoke of tobacco, cuspidors half filled with water, and consumptive travelers provided with sputum cups which may be emptied from the car. It is not necessary to say here that the sole and only danger lies in the sputum. The destruction of the sputum abolishes the disease. When the patient learns that he protects himself in this way as much as others —protects himself from the auto-infection, from the infection of the sound part of his own lungs—he will not protest against such measures.—*Dr. I. W. Whitaker, in the American Lancet.*

Length of Great Bridges.

A comparison between the Forth and other great bridges is as follows:

	Length. Feet.	Greatest Span. Feet.
Forth Bridge	8,091	1,710
Tay Bridge	10,780	245
Niagara Bridge	808	808
Landore Bridge	1,760	110
Crumlin Bridge	1,800	150
Britannia Bridge	1,511	460
Brooklyn Bridge	5,862	1,600

Agricultural Products of the Philippines.

The United States consul at Manila says that the principal products of the Philippines are hemp, coffee, rice, tobacco, corn, and fruits. The cultivation of hemp is a very simple operation, and as it yields a large revenue, it is not surprising that it is a popular occupation among the people. This staple is the product of a species of plantain which grows wild on the Pacific slopes of the volcanic elevations of the Philippine islands, particularly the southern ones. Under cultivation the tree attains a height of 15 or 20 feet, with a trunk from 8 to 12 inches in diameter. In its green state it is crisp and juicy, and can be readily cut down with an ordinary carving knife. The preparation of the hemp for market is very simple. When the tree has properly matured, it is cut down and divided into long strips, which are shredded under a large knife kept in the proper position by a rude lever. This separates the juice and the spongy matter from the fiber, and the latter is spread out in the sun to dry, after which it is packed in bales of about 240 lb. for shipment. There are a large number of plantations owned by natives, as well as by Spaniards and mestizos, where the trees are set out in regular rows, and well cared for. The cultivation of the coffee tree has been followed to some extent for the past thirty years, but interest in this branch of cultivation has been renewed during the past four or five years, and it is expected that its export will increase annually. There is no way of ascertaining the area of land occupied by coffee trees nor the amount of coffee annually produced, as the trees are scattered in various parts of the archipelago. The largest plantations are in the province of Batangas, in the island of Luzon, but many of the natives have a few trees in their front yards, under the shade of the plantains, that may yield four or five bushels of coffee berries. The increase in production has been marked within the past few years. In 1887, a little over 5,387 tons were exported; in 1888, about 7,501 tons. Although rice is the native's principal article of food, there is not enough of it produced in the archipelago for local consumption, and more than 70,000 tons are imported annually. The tobacco industry in the Philippines employs a large amount of capital and a vast number of hands. The best tobacco comes from the provinces of Cogayan and Isabella on the island of Luzon, the average annual yield from these being from 60,000 tons to 100,000. Tobacco is also grown in the provinces of North and South Ilocos, Abra, Lepanto, Nueva Exija, and Union, all on the island of Luzon, and on the islands of Cebu and Panay. The tobacco produced in the former provinces is called *Igorrotes*, while that from Cebu and Panay is designated *Visayas*.

In cultivating, the earth is well plowed and harrowed and the seed sown in September. About six weeks later the young plants are transplanted about two feet apart, and the field is kept free from weeds, and otherwise carefully attended to until February, when the plants are almost ripe. The crop is gathered in March and April. It is then made up into "hands" of one hundred leaves each, the leaves of each hand being fastened together at the stem ends with strips of bamboo fiber. These hands are then hung up in rows upon bamboo poles under long sheds, which are open on all sides, and when they are almost dry they are piled up on the ground and allowed to ferment. The leaves are then dried again and packed into bales for shipment to Manila, where they are repacked and pressed into bales for export, or sent to the factories to be converted into cigars and cigarettes. It is not sold by weight at the plantation, but by the *fardo*, which contains forty hands.

All the tobacco manufactured in the Philippines is made into cigars and cigarettes. The tobacco is classified at the plantation into first, second, third, fourth, fifth, and sixth grades, according to the size and quality of the leaves. In Manila there are twelve large tobacco factories, one of which, La Flor de Isabela, the factory of the Compania General, manufactures seventy-five brands of cigars, ten brands of cheroots, six grades of cut tobacco, and eight brands of cigarettes. These twelve factories give employment to about 11,000 persons. Besides these there are numerous small factories owned by natives and Chinese. Corn holds a very unimportant place among the agricultural products of the Philippines, although it is cultivated to some extent. All the corn produced is that known as maize or Indian corn. The method of cultivation is similar to that followed in more advanced countries, but the implements used are of a very primitive character. As a rule, the land is plowed with a sharpened stick drawn by a buffalo, after which a heavy wooden frame, about four feet square, with long wooden teeth on the under side, is drawn over the ground to break the lumps. The corn is then hoed by hand, and all that is necessary thereafter is to keep the weeds down. No manure nor fertilizer of any kind is used.

No attention is given to fruit culture, and mangoes, bananas, apples, guavas, and numerous other native fruits grow without cultivaton, and are gathered by the natives in the hills and even within the limits of the cities and towns, who bring them to Manila and sell them in the streets and markets. Consul Webb says that no attempt has ever been made to export any of these fruits except a few mangoes, which are sent every year to Hong Kong and other neighboring ports, although it is quite probable that under a proper system of cultivation, grafting, etc., some remarkably good fruit might be developed that could be preserved or canned, and sold at a great profit in Europe and the United States.

Manufacture of "Compressed Yeast."

In a thesis presented to the school of pharmacy of the University of Wisconsin, Mr. Alfred J. M. Lasche describes how compressed yeast is made in various parts of the United States. The thesis is printed in the *Pharmaceutische Rundschau* of New York. In regard to the preparation of the mash, it is stated that 3,130 lb. of ground corn are mixed with 4,500 gallons of water. This mixture is heated to 190° F. (to swell the starch, and thereby facilitate its inversion) and subsequently cooled to 154° F., then 1,920 lb. of ground rye and 550 lb. of ground malt are added, the malt being specially employed for the amount of diastase it contains, and is indispensable in the converting process. This mixture is then allowed to stand one hour, and is finally cooled to 80° F. The proportions of the different grains are of course largely a matter of opinion, and the various yeast manufacturers have different working formulas.

When the mash has cooled to 80° F. it is drawn off into another tub, and one gallon of concentrated sulphuric acid is added, in order to dissolve all remaining starch, dextrin, and glutinous matter, and to convert them into grape sugar. Finally, a quantity of compressed yeast is added to start the fermentation. This yeast settles to the bottom of the tub, but as soon as fermentation has started (usually in half an hour), and carbonic acid is being generated, the current of the latter gradually carries the yeast to the top of the liquid. It remains there, covered by a layer of the chaffy parts of the grain, until the yeast has accumulated in a sufficiently large quantity, and the current of carbonic acid has become strong enough, when it eventually breaks this film of chaffy particles, and collects on top of it in the form of foam. This goes on until all the nutritive matter has been assimilated. The foam, containing all the yeast, rises about two feet above the top of the liquid, dependent on the size of the tub, and when no more effervescence is noticeable, fermentation is complete.

Immediately after fermentation has ceased the foam is drawn off by means of troughs, and run, together with a fresh supply of water, into a revolving, six-sided and declining cylinder, lined with a sufficiently fine strainer. During this step of the process nearly all the chaffy remnants of the grain are separated, and the liquid, containing the yeast plant in suspension, is allowed to flow into a basin, whence, by means of a trough, it finally flows into a large tub.

The product in this tub is prevented from further fermentation by the addition of a sufficient quantity of ice. The yeast is now allowed to settle, the supernatant liquid drawn off, and the residue repeatedly washed to free it from all mechanical impurities.

When sufficiently cleansed, it is run into a press by means of a steam pump. The press is constructed of a column of iron frames, both sides of each frame being covered with a very fine straining cloth, and all the parts fitting tightly into each other. The yeast having been pumped into such a press, the water is separated from it by means of the strainer, and carried off through a waste pipe.

The yeast, now compressed, is taken out in the form of large cakes, and in this condition it is brought into commerce.

Arithmetical.

Briefly stated, the rule of least common multiple is as follows: Continue dividing the numbers in question by the least measure which is common to two or more of them, until there are left no other two numbers which are divisible, without a remainder, by a quantity greater than unity. Then the product of the divisors and the remaining numbers will give the least common multiple, thus:

2) 1, 2, 3, 4, 5, 6, 7, 8, 9, 10,
2) 1, 1, 3, 2, 5, 3, 7, 4, 9, 5,
3) 1, 1, 3, 1, 5, 3, 7, 2, 9, 5,
5) 1, 1, 1, 1, 5, 1, 7, 2, 3, 5,
1, 1, 1, 1, 1, 1, 7, 2, 3, 1,

$2 \times 2 \times 3 \times 5 \times 7 \times 2 \times 3 = 2520$ = the number which is divisible without a remainder by the first ten numerals.—*H. P. Turner, in Eng. Mech.*

MR. DENMAN THOMPSON, the father and chief actor in the comedy of the "Old Homestead," which has been played steadily for so many months in this city, is an inventor. He has recently patented a railroad truck, the object of which is to prevent disaster from derailment or to lessen the peril of railroad travel. He has a handsome model which is on exhibition at the Westminster Hotel, where the inventor resides.

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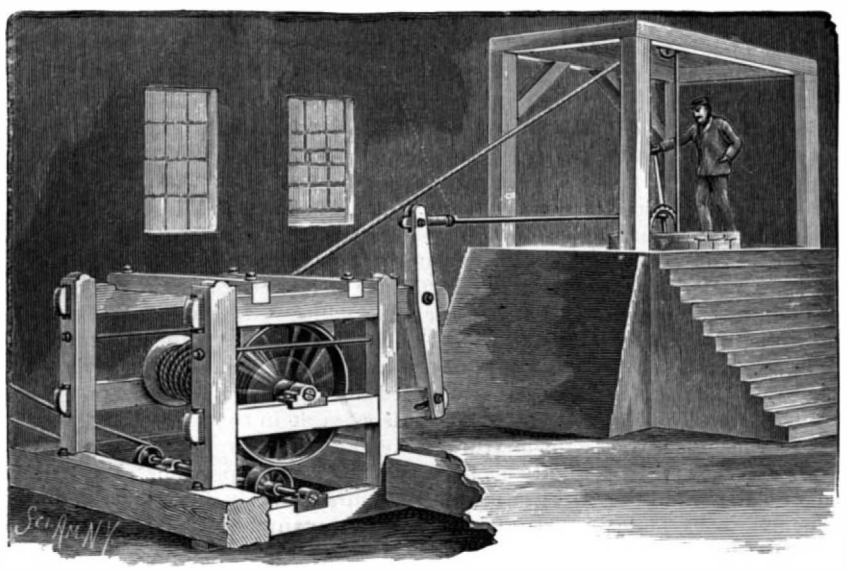
AN IMPROVED HOIST.

A hoisting apparatus adapted to raise material from a mine shaft and for other purposes is shown in the accompanying illustration, and forms the subject of a patent issued to Mr. Frank A. Robitaille, of Helena, Montana. Three of the side bars of the drum-supporting frame are held in position by keys, while

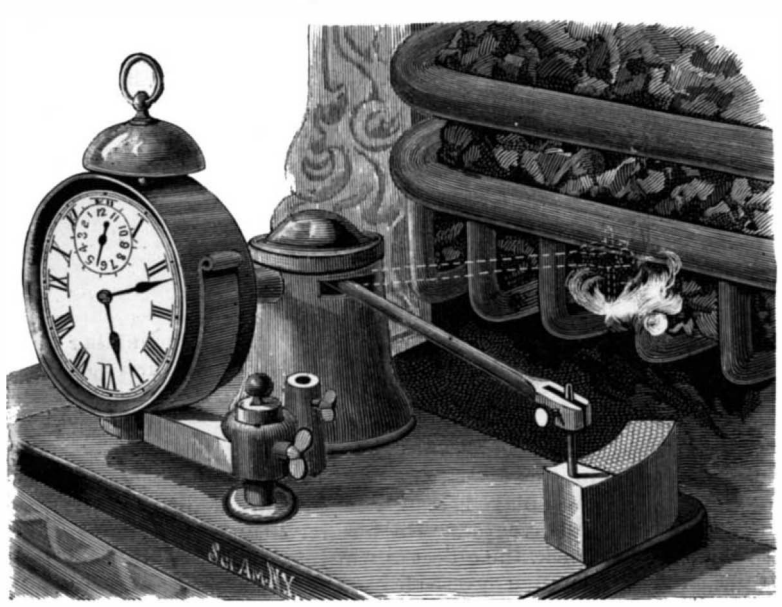


ROBITAILLE'S HOIST.

the third side bar, in which is journaled one end of the drum shaft, is pivoted in one of the standards of the frame, its other end being capable of a limited vertical movement in the opposite standard. In the lower part of the frame is a countershaft, on one end of which is a driving pulley, receiving power from any convenient source, and near the other end of the shaft is a friction pulley adapted to bear upon the face of a larger pulley directly above on the drum shaft. To one of the top side bars of the frame is pivoted a vertical lever, the lower end of which has a pivotal connection with the outer end of the pivoted side bar in which one end of the drum shaft is journaled, such pivotal connnection being made through a slot in the side bar, so that when the lever is moved forward or backward the side bar, with one end of the drum shaft, will be raised or lowered. To the under side of the top side bar, just above the large pulley on the drum shaft, is attached a curved brake shoe, by raising the pulley against which the rotation of the shaft may be stopped entirely, or its speed regulated as desired. The upper end of the vertical lever is connected by a rod to a lever pivoted at the mouth of the shaft, the latter lever having a suitable latch adapted to engage a notch in a rack. The rope attached to the drum in the drum-supporting frame passes over a pulley in the top of the frame at the mouth of the shaft, and is then attached to a bucket or cage. With this construction the operator at the mouth of the shaft can, by means of the hand lever, throw the large pulley on one end of the drum shaft into close contact with the friction pulley on the power shaft, to wind the rope upon the drum, or can, by moving the lever in the opposite direction, break such contact, and allow the weight of the bucket as it descends to unwind the rope on the drum, the latter movement being also controlled by pushing the lever still further, to bring the large wheel into contact with the brake shoe.

A DEVICE FOR AUTOMATICALLY LIGHTING FIRES.

The accompanying illustration represents a portable device, readily attachable to any small alarm clock, for automatically lighting a fire in a stove or grate at any predetermined moment of time. The dotted lines in the picture show the fire being started at twelve minutes past five in the morning, thus indicating how a comfortable "last nap" may be taken while the water is being heated for the coffee, or the room warmed. The invention has been patented by Mr. Henry W. Borchers, of Albina, Oregon. Upon the base plate is a post which may be adjusted as to its distance to or from the grate, and on this post an arm is adjustably held by means of a hollow hub and thumb screw, the outer end of the arm having a spring clasp adapted to embrace the cylindrical body of a portable alarm clock. Adjacent to the clock, upon the base plate, is a hollow column in which is an upright shaft surrounded by a spiral spring, and having near its top a locking disk having on one edge a toe adapted to abut against the upturned end of a curved locking spring, the other end of which is attached to the side of the upright column. An arm from the locking disk projects laterally through a horizontal slot in the wall of the column, the outer end of the arm having a clamp in which a match may be held as it is drawn over a scratch block. A sleeve in the side of the column nearest the clock supports a rock shaft, on the inner end of which is a lug adapted to depress the locking spring and release the toe of the locking disk, the outer end of the shaft being slotted to receive a tongue on the outwardly projecting end of the alarm mechanism of the clock, which may be of any approved construction. The tongue and slotted connection of the alarm mechanism of the clock with the rock shaft of the lighter is effected by simply sliding the shafts together, when, the alarm being put in motion, the locking disk will be released, and the arm carrying the match be made to swing around by the tension of the coiled spring, as shown in dotted lines in the illustration. When the lighter is to be used where there is no convenient place on which to rest the bed plate, a stand is provided having an upright rod adapted to engage an upwardly projecting boss on the bed plate, the device being then firmly held at the proper height by a thumb screw.

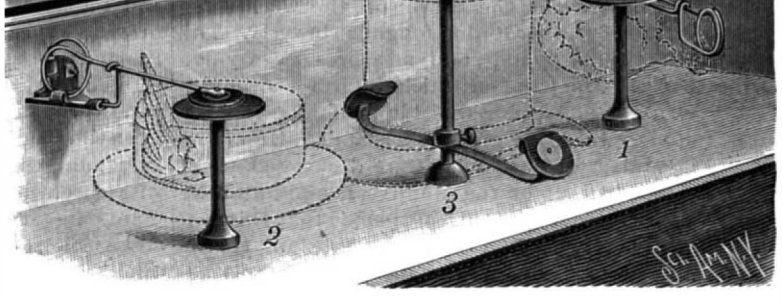


BORCHER'S AUTOMATIC FIRE LIGHTER.

AN IMPROVED HAT HOLDER.

A device for supporting head gear, such as hats and bonnets, whereby they will be firmly held without crushing or injury, while traveling, etc., whether in a trunk, box, or other receptacle, or placed in a show window or on a counter for exhibition, is represented in the accompanying illustration, and is the invention of Mrs. D. M. Fuller, of No. 104 Vanderbilt Avenue, Brooklyn, N. Y. The invention has been patented in the United Sates, Canada, England, and France. The various figures illustrate the ready adaptation of the device to use in various positions and adjustment to hats of different sizes and kinds. The body of the device consists of a pedestal having a disk-like cap covered with any soft material, such as velvet, felt, etc., while in the enlarged lower end of the pedestal is a projecting pin or bolt, preferably adapted to receive a nut and washer, for attaching the pedestal to the bottom wall of a receptacle. To hold a bonnet on this pedestal, as shown in Fig. 1, a spring wire clamp is employed, one end of the wire of such clamp being connected with the pedestal just below its cap, while the end of the other arm of the clamp is covered with a cap of soft material. The clamp is formed of a single piece of wire, so bent as to provide a catch facilitating the ready engagement or disengagement of the clamp.

The manner of securing a gentleman's high hat on the holder is shown in Fig. 3, spring arms being attached to the pedestal near its lower end by means of a thumb screw, and the outer ends of the arms being provided with a pad of the proper shape to fit over and clasp the edges of the rim on both sides. In Fig. 2 is shown a hat held on the pedestal by means of a spring arm held in a bracket attached to a side support. It will be readily seen that the device may be expeditiously and conveniently applied to any receptacle, and is capable of adaptation to various positions and adjustment to hats of different sizes.



FULLER'S HAT HOLDER.

AN IMPROVED CAN OPENER.

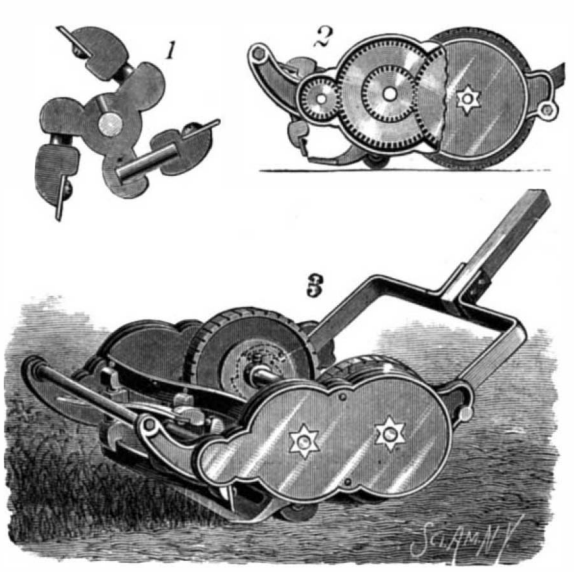
The accompanying illustration represents a simple and effective implement for readily cutting the head of a sheet metal can nearly free from the side wall, producing a lid but slightly joined to the can by a narrow strip of metal, and which can be readily opened or removed to afford access to the contents. It has been patented by Mr. Edward K. Boothby, of Portland, Me. Two limbs having handles are pivoted together,

BOOTHBY'S CAN OPENER.

and on one of the limbs, at a suitable distance from the pivot center, are two laterally extending arms having pointed tongs adapted for insertion in the edge of the can top. On the other limb is a curved cutting blade, at such distance from the pivotal point that when the handle is swung around, it will describe a circle near the edge of the can. The limbs are pivoted together by means of a thumb screw, and have different apertures whereby the pivotal point may be changed to accommodate the implement to larger or smaller cans. This implement does not make the rough edges produced by the ordinary can opener, but rapidly effects a clean, smooth cut in the lid of a can of any size. For further information relative to the invention address Messrs. Boothby & Co., Portland, Me.

AN IMPROVED LAWN MOWER.

The illustration represents a machine patented by Mr. Louis Meyer, of Utica, N. Y., in which the cutter knives are of the usual twisted form, to give to their beveled cutting edges a shearing action when the cutter head blocks and attached knives are rotated by the gearing whose prime movers are the ground wheels. Fig. 1 is a sectional view of one of the knife-supporting heads, and Fig. 2 is a side elevation of the machine with the cover of the multiplying gear case broken away, Fig. 3 showing the complete machine in perspective. The trefoil form of the cutter head blocks,



MEYER'S LAWN MOWER.

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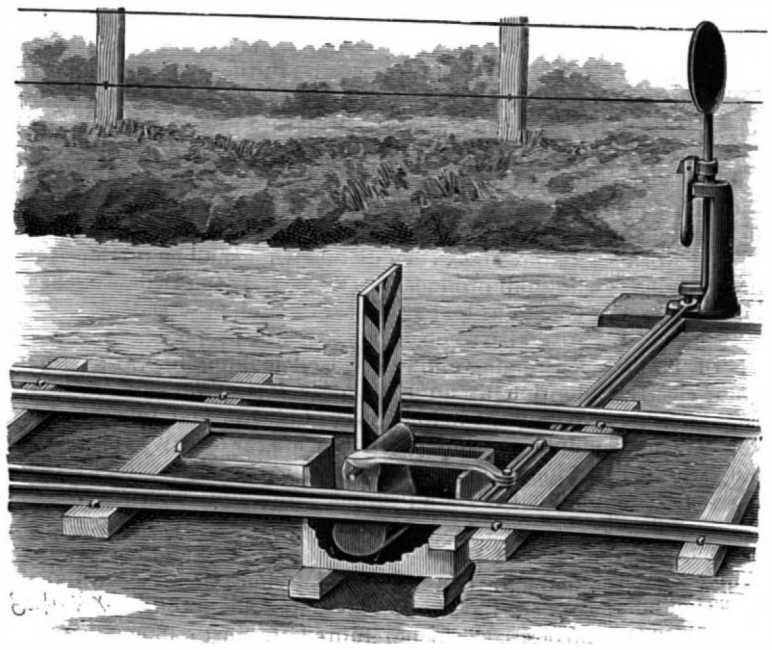
with their equally spaced and similarly shaped limbs, afford efficient means for the accurate and convenient adjustment of the knives, the grass roller being also adjustable and furnished with an adjustable cover to protect the roller from being impeded in its action, while a throat slot is provided in the cover to discharge grass accumulations through it. In the front of the machine, on the cross bar that retains the side pieces, is a protecting guard, preferably of rubber, whereby injurious contact with trees or shrubbery is avoided. There is no cutting action when the machine is moved backward, the cutter knives then being dormant, and injury to their cutting edges is avoided when the machine is drawn by its handle from place to place.

AN IMPROVED SWITCH SIGNAL.

The signal represented in the illustration is adapted to be located between the rails of the track, and is designed, when the switch is open, to be in an upright position. It is counterbalanced, so that the train being switched may readily pass over the track when the signal is displayed, while the signal will immediately return to its upright position after the train has passed. The invention has been patented by Mr. William R. Thomas, of Watertown, Wis. The switch rails are moved in the ordinary way by a switch rod, upon which is rigidly held an arm beveled at its outer end, where there is also a swell or projection on its under face. Near the switch rod, and beneath the track surface, is a box, having on one side a horizontal flanged table, and in this box is pivoted a signal, one end of which is

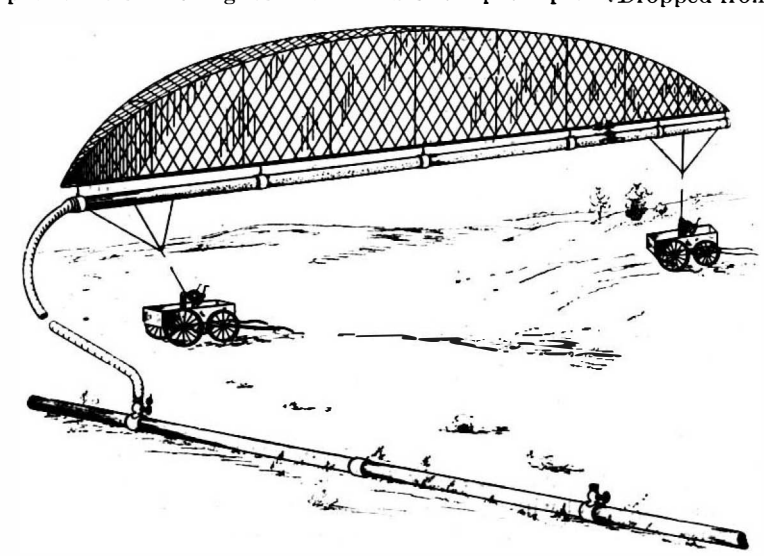


THOMAS' AUTOMATIC SWITCH SIGNAL.

weighted, while the other end presents a broad colored surface or may bear a flag. The entire signal is of such length that when brought to a horizontal position, it will extend from the outer end of the table to the opposite end of the box. To open the main line the switch rod is moved so that the beveled end of the arm secured thereon strikes the weighted section of the signal above its pivot and gradually presses the signal down to horizontal position, holding it there until it is desired to close the main line and open the switch. As this is done, the arm on the switch rod being carried out of contact with the signal, the latter, by reason of its weighted end, automatically assumes a vertical position, rendering the display or upper section visible from up or down the track.

AN IMPROVED IRRIGATING APPARATUS.

The illustration represents an apparatus patented by Mr. Edward C. Chapman, of Leadville, Col., designed to distribute water in fine streams or drops upon more or less elevated surfaces. The invention contemplates the furnishing of water under adequate pressure through a main conduit, by a pump or other means, and at different points along the conduit pipe are outlet valves to which a hose or flexible tubing may be attached. Upon the other end of the hose is attached an extended water conductor or pipe, having perforations in its lower semi-circumference, adapting it as a sprinkler. An elongated chamber, filled with any gas lighter than the air, is attached to the water conductor, to hold it, on the principle of a balloon, above the surface of the earth, while guy ropes from the conductor lead to the drums of winches mounted on loaded wagons, by means of which the conductor may be anchored in any desired locality. When the device is in service, it is designed to produce an artificial rain-fall, the area of which is extended by moving the conductor by means of draught animals attached to the wagons, and by connecting the hose to different outlet valves along the main conduit.

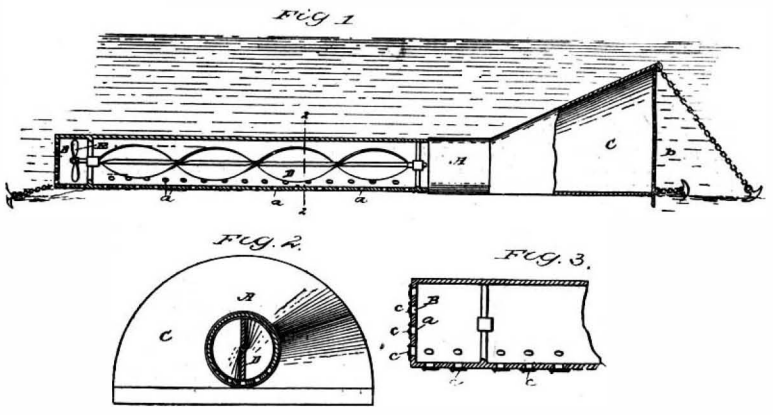


CHAPMAN'S IRRIGATING APPARATUS.

AN IMPROVED CHANNEL CLEANER.

An apparatus to be anchored in a channel where there are sand bars, to agitate the water and stir up the sand, so that the current may remove it, is shown in the accompanying illustration. A trunk or large tube, A, with perforations, *a*, along its bottom, and with a flaring mouth, C, at its up-stream end for concentrating the current, is anchored in a channel where there are sand bars, the down-stream end of the trunk being closed with a perforated cap, B, the apertures having hinged valves which allow the water to pass out of the tube, but close when the flow of water is in the opposite direction. In the trunk is journaled a spiral screw, D, on the lower end of which is mounted a motor screw, E. The current of water passing through the trunk rotates the spirals and the motor screw, thus communicating motion to the water outside of the trunk in the vicinity of its bottom perforations, loosening the sand and causing it to be carried along by the current.

For further information relative to this invention address Mr. William Evans, the patentee, in care of Mr. Marcus Hamer, corner of Twentieth and Mechanic Sts, Galveston, Texas.



EVANS' CHANNEL CLEANER.

Bread Buttering Machine.

One of the latest and most unique inventions is a machine for buttering bread. It is used in connection with a patent bread cutter, and is intended for use in prisons, workhouses, and other reformatory institutions. There is a cylindrical shaped brush which is fed with butter, and lays a thin layer on the bread as it comes from the cutter. The machine can be worked by hand, steam, or electricity, and has a capacity of cutting and buttering 750 loaves of bread an hour. The saving of butter and of bread and the decrease in the quantity of crumbs is said to be very large.

Strong Oxygen Cylinders.

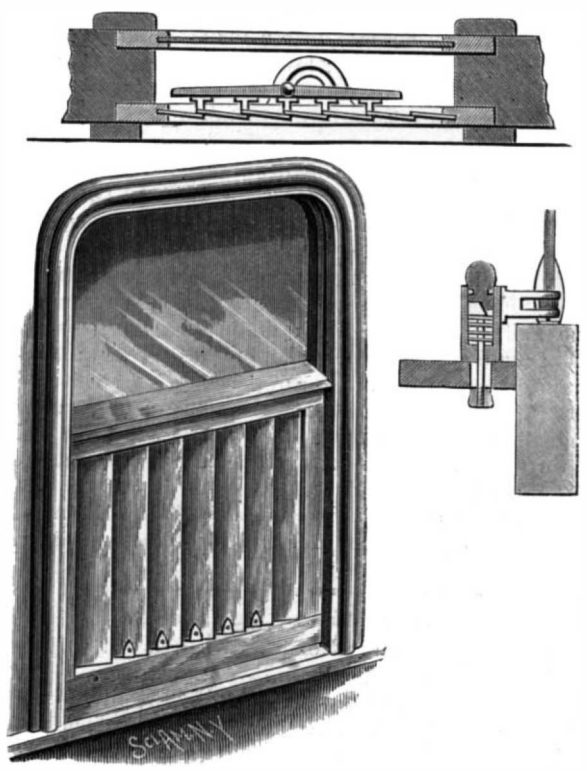
A test of metallic cylinders for holding oxygen was lately made at Glasgow. The cylinders were of ¼ inch steel, 6½ ft. long, 5½ in. diameter, weight 107 lb. They had been subjected twice to the ordinary test pressure of 3,600 lb. to the square inch, the practice being to make them more than twice as strong as the normal pressure to which they are regularly charged with the gas, namely, 1,800 lb. to the inch. The test in this instance was to try the strength of the cylinders in respect to indentation, breakage by falling, etc. Dropped from a height of 35 ft. upon iron blocks, the cylinders were only slightly indented. Weights of 600 lb., dropped from a height of 35 ft. in the center of the cylinder, which was supported at the ends, bent and flattened the cylinder somewhat, but caused no leakage of the high pressure gas.

A Court of Patent Appeals.

The bill which has been introduced in Congress to establish a court of patent appeals seems to be a step in the right direction. Litigation growing out of patents for inventions is becoming very voluminous; and, what is more, the cases being generally suits in equity, reach the Supreme Court on voluminous records, presenting questions for decision which depend largely upon the solution of disputed and complicated facts, which facts are again involved in questions of mechanics. It is obvious that a court competent to deal with such questions must be a court composed of experts in that department of the law. Moreover, they should not have too much work to do, in order that they may give the necessary attention to each case. Although, counting the cases, the patent, trade mark, and copyright cases which come before the Supreme Court are not very numerous, yet it is believed that, considering the size of the records and the difficulties of the questions involved, they occupy a very large portion of the time of that tribunal. It should not be troubled at all with such questions, except in so far as may be necessary to a proper superintendence of a court of patent appeals.—*American Law Review.*

AN IMPROVED DUST GUARD AND VENTILATOR.

The accompanying illustration represents an attachment for car windows designed to prevent smoke, dust, and cinders passing into the cars while being ventilated, and also to prevent the passage of very strong currents of air while the car is in motion and the window raised. The invention has been patented by Mr. Joseph B. Ballard, of Ballardsville, Miss. A frame is made to fit the window, extending as high as the bottom of the upper sash, or higher if necessary, the side pieces of the frame being adjusted between cleats of the window frame, and there being an inwardly projecting strip on its upper edge extending close up to the upper sash, to prevent cinders from falling between the frame and the car window. The window portion of the frame is formed of a series of transparent slats, preferably of glass, as shown in the sectional view at the top, all of which except the end slats are pivotally supported in the upper and lower cross pieces. The pivotal slats are of such width that when turned edgewise they permit of convenient attachment to an operating lever, as shown in the small sectional view. The pivot plates have extension or winged portions adapted to lap the sides of the slats, thereby making a strong connection with the glass, and the outer ends of the extensions of the lower set of plates have apertured ears pivotally connected with lugs projected inward from a reciprocating operating lever. This lever is supported on an inwardly projecting plate secured on the cross piece of the frame, and is capable of being locked in any portion of its movement on the plate by a simple locking device. The entire construction is designed to be afforded at a small cost, and to be readily adjusted to car windows of the ordinary description.



BALLARD'S DUST GUARD AND VENTILATOR FOR CAR WINDOWS.

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THE ROWELL AUTOMATIC RAILWAY SAFETY STOP.

(*Continued from first page.*)

brings the incline to the level with the top of the rail, thereby breaking connection with the locomotive.

In Fig. 5 we show the portable device. This is made of hard wood, four feet and four inches long, top edge being inclined both ways from the center, so that it cannot be placed in wrong position, and weighs less than ten pounds. Two steel clamps at the ends hold it the proper distance from the rail and steady it in position. The clamps are of steel, four inches wide and three-sixteenths of an inch at the thickest part, where they go over the rail, and beveled off to a knife edge each way, thus presenting no obstacle in the way of the passing car wheels. At the bottom edge of this board are small spikes, which are crowded into the sleepers and hold the board firmly from slipping. The effectiveness of this device does not depend upon the speed of the train. It stops the train without the aid or knowledge of the engineer, who can by this absolute protection maintain a high rate of speed on the darkest night when it is impossible to see the signals.

B. C. Rowell, the inventor, is an old railroad man, having been for many years brakeman and conductor, and thus has a practical knowledge of exactly what is of use in an emergency.

This safety stop, while absolute in the protection afforded, is comparatively inexpensive, certain in action, and easily applied. Its general adoption by the roads would greatly lessen the dangers of travel, and entirely do away with nine-tenths of the accidents that

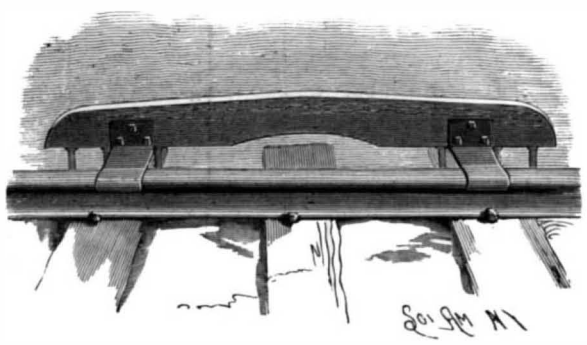

Fig. 5.—PORTABLE SAFETY STOP IN POSITION.

are so costly to the companies. Full particulars can be had by any one interested by addressing the Rowell Automatic Railway Safety Stop Co., No. 620 Atlantic Avenue, Boston, Mass., of which Benj. S. Lovell is president and Irving B. Sayles treasurer.

The Largest Wooden Vessel Afloat.

The *Philadelphia Press*, reporting the arrival at that port recently of the wooden vessel Rappahannock, says she is the largest wooden vessel afloat. She was built at Bath, Maine, and cost $125.000. The vessel is 287 feet long, 48¾ feet beam, and her total tonnage is 3,053 net. In the construction of the ship 700 tons of Virginian oak and 1,200,000 feet of Virginian pine timber were used. The frame is oak, well seasoned when put up, and the first quality of Georgian pine was used in the ceiling, deck, frames, and planking. The main keelson is 3 feet 2 inches in depth; bilge keelsons, 14 inches flush; lower deck beams, 15 inches by 15 inches; between deck beams, 12 inches by 14 inches; upper deck beams, 12 inches by 14 inches; and the spar deck beams at the main hatchway are 18 inches by 18 inches. The decks are of yellow pine, and the quarter deck extends forward to the mainmast. The Rappahannock is the heaviest sparred ship that ever carried the stars and stripes. Her mainmast is 89 feet long and 38½ inches in diameter; the foremast is 88 feet long and 38 inches in diameter; the maintopmast, 58 feet; maintopgallant mast, 71 feet; main yard, 95 feet; fore yard, 95 feet; lower maintopsail yard, 87 feet; upper maintopsail yard, 87 feet; lower maintopgallant yard, 70 feet; upper maintopgallant yard, 64 feet; main royal yard, 53 feet; main skysail yard, 43 feet. The lower masts are of Georgian pine, and the other spars of Oregon pine. The ship has a steel bowsprit, which is an innovation. She has no jibboom. Her spread of canvas will be 15,000 yards.

A New Niagara Ship Canal.

The committee on railroads and canals of the House of Representatives has taken favorable action in relation to the bill for the construction by the government of a ship canal around Niagara Falls between Lake Erie and Lake Ontario. The route most favored is 21 miles long, and an appropriation of $10,000 for the arrangement of the preliminary details is included, together with $1,000,000 for beginning the actual work of construction. The proposed canal is to be 100 ft. wide at the bottom, with a minimum depth of 20 ft., its estimated cost being $23,000,000. The consideration of such an outlay is primarily its commercial value, but, in view of our present treaty provisions which allow the maintenance of but one gunboat by this government on the lakes, its value in event of a war with England is apparent.

Storage Battery Electrical Cars.

In this city the Fourth Avenue Street Railway Company is still running a few of its storage battery cars, but they have not yet attained that degree of success which is expected.

In Birmingham, England, a line of these cars is now under construction.

In Brussels the Tramways Company has decided to discontinue running the electric tramcars from the 1st of May next and to return to horse traction. The reason for this action is that the service of electric tramcars has caused a deficit of £1,144, and this sum forms the difference between the cost of electric and horse traction.

The company considers, after having had an experience of electric tramcars for four years, that that period has been sufficient to prove that whatever reductions may be made in the maintenance of the accumulators, and whatever the possible improvements in the mechanism of the motors, accumulator traction is not practically applicable to the company's system from a remunerative point of view, bearing in mind the particular conditions of the service. After referring to electric traction in other countries, the company concludes that from the experience at Brussels the most economical system of working tramcars is by animal traction.

La Gazette, in a long article on the subject, states that the adversaries of electric traction affirm that the cost per car kilometer is 4d., or 6½d. per car mile, while the advocates of the system maintain that the cost is only 2½d. per car kilometer, or 4d. per car mile. That journal then goes into figures, and endeavors to show that the cost per car mile in the two systems of traction, apart from the maintenance of the accumulators, is slightly less in the case of electric cars.

It must be remembered the cars have been worked under disadvantageous conditions. They are of small capacity, and the line traversed by them has some none too easy gradients. Moreover, although only three cars were provided, the station in the Rue Juste-Lipse was arranged with machinery sufficient for working eight cars, and this in itself was a disadvantage, since the general expenses of eight cars would be about the same as when only three were employed.

In Paris about six months ago the Northern Tramway Company commenced the running of four electric tramcars on the line from Levallois to La Madeleine. The cars are self-contained or accumulator cars, and were originally started as an experiment to see whether accumulators could be satisfactorily employed. The electrical energy is supplied by Faure-Sellon-Volckmar cells having twin plates. The number of cells in each car is 108, and they are placed in 12 boxes, each containing 9 cells in series. Each cell weighs 33 pounds, and the total weight of the battery is nearly 32½ cwt. The twelve boxes are placed in four lockers, situated at the angles of the car, four carried at the front and eight at the back of the car. The connections are so arranged that on putting the cells in place they are automatically grouped three in series, thus forming four groups of 27 cells each. These groups can for working purposes be coupled in four different ways. They can be arranged in parallel or in two groups parallel; three groups can be run in series, the fourth being in parallel with one of the three others, or the four may be connected in series. There is provided a fifth connection, which is obtained by means of an auxiliary commutator, which regulates the inequality of the discharge caused by the third method of coupling up. These connections are effected by means of a commutator in the shape of a wooden cylinder having contacts on its periphery. These contacts are connected to each other by inner pieces insulated from the metal axis of the cylinder. The positive and negative poles of the four groups correspond to eight fixed brushes. The cylinder is operated by means of a crank.

A Siemens motor, which is placed under the front of the car, runs normally at 1,000 revolutions, but a speed of 1,600 turns can be attained. The power is taken from the motor by an endless rope running over a set of gearing actuating the car, and which reduces the speed of the motor in the proportion of 26 to 1. The motor is reversed, and the car backed, by means of a special arrangement, comprising double V-shaped brushes. A single branch of the V of each brush touches the collector, but by causing the brushes to move by means of a lever the branches in contact are raised, and the other two are placed at 90°. Thus the direction of the current is reversed, and consequently that of the car. The weight of the car is 3½ tons, making, with accumulators, a total of 5 tons 2½ cwt. The cars each carry fifty passengers, and run normally at 6¾ miles an hour. At this speed on the level the power required is 4½ electrical H. P., on an incline of 1 per cent 8 H. P., on an incline of 2 per cent 11½ H.P. At 5½ miles an hour, on a gradient of 3 per cent, 12½ E. H. P. is required, and 15½ E. H. P. is necessary on a 4 per cent gradient. When running at 3 miles an hour on a gradient of 5 per cent, the E. H. P. is 10½. The French Electric Accumulator Company estimates that the cost of electric traction on the line in question amounts to 30 centimes per car kilometer, or about 4¾d., or a little less than 10 cents, per car mile.

Let the Government Help Everybody.

The effect of the special legislation and special bounty some of the silver men are asking from Congress is already becoming apparent. The agricultural classes, whose needs of public help are greater than those of any others, are putting forward their claims. Senator Vance has, at the request of the Farmers' Alliance, introduced a bill in Congress which calls for the erection in every county of the United States of a Federal warehouse, in which the owners of agricultural products may deposit the same and receive treasury notes for 80 or 85 per cent of the market value of these products, the notes to become part of the public currency.

Of course every advocate of the silver warehouse scheme will assert that the agricultural warehouse plan is preposterous, and not much better than the plan proposed some time ago by a Chicago paper, that the government purchase all the whisky manufactured, and issue therefor legal tender certificates, somewhat in the manner of the proposed silver certificates; and it is claimed for whisky that, as a basis of currency, it would have the unique advantage of increasing in value with age, thus earning its own interest, and after a certain number of years the government might sell a portion for the cost of the whole, and would thus make a handsome profit. Yet this proposition no doubt appears very absurd to nearly every one. The Farmers' Alliance consider its plan to have government warehouses a very serious one. Next we may reasonably expect the lead melters and the copper producers and iron furnaces to ask the government to indorse their warehouse certificates or to buy their products at some fictitious "market price."

When the government buys what every one produces, and pensions every individual in the nation with the taxes collected from every one, we shall have arrived at Bellamy's ideal state, and the government will, of course, then dictate what shall be produced and who shall produce it. We confess the Bellamy scheme seems to us to be a sensible and practical plan compared with some of the schemes proposed, and we are accustoming ourselves to "looking forward" to its adoption at an early date if the present craze for government help in every industry and by every individual continues. Before long we may expect every business to draw a bounty in some shape and every individual to get a pension.—*Eng. and Min. Jour.*

Possibilities of the Telephone.

Though the telephone has long since ceased to be a wonder, its great powers and adaptability to various purposes, as yet but hinted at, must still command attention, very much on account of their commercial aspect. This is evident on contemplating the work done by this instrument in the installation at the Lenox Lyceum, by which the "long distance" telephone company has placed before the public an exhibit of superb qualities. It seems strange, indeed, that up to the present time, the telephone companies have not done more toward exploiting a field which could certainly be made a source of considerable revenue by the furnishing of musical and other entertainments by wire at the fireside. But still more impressive than the musical part is the remarkable clearness of the long distance transmission. Although we are all accustomed to ordinary local telephone transmission, the mind can yet hardly grasp the reality of the enormous progress which permits persons hundreds of miles apart to maintain perfect oral intercourse. Yet we believe the time is not remote when even this will cease to attract even passing notice, and when the "long distance" lines, now mostly confined to the Eastern States, will cover the entire conntry with a vast network of "speaking wires." The "long distance" company is to be commended for the liberal policy adopted by it, in educating the public to the proper appreciation of the facilities available for it, and, if we are not mistaken, it will date one of its quickest and longest strides forward from the display at the Lenox.—*Electrical Engineer.*

Novel Fire Protection.

Seattle, Wash., has a rather novel scheme for utilizing its new fire boat as an aid to the land engines in cases where the burning buildings are too far from the water front to be reached by a stream directly from the boat. Briefly the plan is to provide four or five berths for the boat at different points on the harbor front, and from these points lay an auxiliary system of eight and six inch water mains through the business district of the place. These pipes it is proposed to connect with the hydrants, and through them the boat is to be made to force up salt water for the use of the engines in case of a failure of the fresh supply. The plan is a simple one, and there seems no reason, *Fire and Water* thinks, why it should not work satisfactorily. And why might not the same plan be advantageously adopted in New York and other Eastern cities? It is certainly worth considering.

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Correspondence.

A Correction—Eugenol or Sodium Fluoride.

To the Editor of the Scientific American:

In your paper of April 19 you quote from the *Dental Cosmos* an article on "Sodium Silico-Fluoride." Where do you get your authority for saying eugenol *or* sodium silico fluoride? J. D. M.

[ANS.—The use of the term eugenol in the connection stated was our error, not the *Cosmos*'.—EDS. S. A.]

Paint Preservations for Iron.

Mr. L. Matern, of Bloomington, Ill., writes as follows in the *Painters' Magazine* concerning an article in the SCIENTIFIC AMERICAN, February 22, 1890, by Prof. Lewis:

He quotes boiled linseed oil as unfit for painting iron, because lead is used in boiling and purifying it, but does not seem aware of the fact that through boiling, oil loses its binding quality for forming chemical combinations with strong base pigments, as red lead, litharge, umber, oxides of manganese, etc., which are of the highest order for preserving iron, wood, etc. Raw linseed oil is deprived of its best binding qualities by boiling, when it loses its gelatinous acid. By extracting linseed oil from linseed meal with benzine (percolation), where the fatty matter of the oil is only obtained, the remainder being left in the meal. By driers, which combine with the oleo acid and separate, leaving again the fatty matter to become resinous by exposure to the oxygens of the air. Oil in that condition is chemically neutral, and forms only a mixture with the base pigments. When iron is coated with tar or asphalt it must undergo heat (impracticable most of the time) so as to drive off all except the coal contained in it; otherwise it gives no protection.

Iron ore, a faint base, has but little affinity to linseed oil, and communicates part of its oxygen in a damp place to the metal iron it is to protect from rusting, thereby causing the iron to rust. This paint is a good "red wash" for wood, as can be noticed on barns painted with it, where any one can observe that the nail heads painted with iron ore paint rust all the same. The chief good of iron ore paint is that it costs little.

Again, the man who can cleanly scrape off rust from iron without resorting to filing, grinding, fire, or acids, is still unborn. The least trace of rust left will start anew corroding it in a damp place in spite of all paint. Iron painted while hot, as the professor will have it, is liable to destroy the quality of the oil when heated above 150° F., and adds nothing for its protection. Where durability of paint is required to protect iron, it should have a strong base of a pigment of poisonous quality—a strong base to unite with linseed oil in a chemical combination not soluble in water, and a poison to ward off all animal and plant life. Also the pigment must be such that it does not impart or conduct oxygen to the iron. In all my years of experience nothing has proved better to preserve iron than pure red lead (not white lead) ground in raw, one year old, cold-pressed linseed oil, applied fresh from the mill to unrusted iron. Proofs of this have lain for years in a wagonmaker's yard, deep in the ground, which when dug up were rusted through except where protected by red lead paint.

An Old Indian Fort.

A thorough examination has recently been made of Fort Ancient, the old Indian remains in Warren County, near Cincinnati, Ohio. This work has been conducted by Mr. Warren R. Moorehead, who has published a book on the subject. The ruins are very extensive, the whole fort being included within embankments that are 18,712 feet in length. The extreme distance between the outer embankment of the old and new fort is 5,000 feet. The average height of same is 12½ feet, while in places it reaches a height of 22 feet. Mr. Moorehead states that the fort was a defensive earthwork which in time of danger was used as a place of refuge by some large tribe of Indians, and at certain periods a large village was situated within its walls. He believes that the structure was raised by some tribe as a fortification against some hostile nation, and that the natives residing within a large adjacent district were allied and held this structure in common, and fled to it in time of trouble, while in peace the fortification was kept in repair by a certain number who were detailed for that purpose. Over two hundred skeletons were exhumed in the excavations. There were two modes of burial; one in a grave of stone, while the more simple mode consisted in simply piling stones over the remains of the dead. Pieces of pottery and other relics were discovered.

THE chicken business is a matter of wonderful importance to the table comfort and the financial outlook of the American farmer. Government statistics show that the annual expenditure in this line is $560,000,000; and despite the immense production of eggs, several million dollars' worth are annually imported to meet the deficiency of the home supply.

Dangerous Havana.

Havana's dangerous attitude to commerce is shown by the following communication in the *Sanitarian:*

As the season approaches when the increasing heat produces a corresponding fear of disease, and the time is at hand when health and municipal authorities take special precautions against the outbreak or spread of infectious or contagious diseases, it may not be uninteresting to note down some aspects of the sanitary situation of the cities of the Southern States and of those countries lying adjacent to our southern line. It seems to be fully agreed that from one point comes the greatest danger to the South and the seaboard cities of the United States—that from Cuba, and especially from Havana, those diseases which are most to be dreaded during the heated term are most easily imported.

The inspection of the steamers plying between Havana and the ports of the United States is so close and searching, and the penalties for infraction so severe, that the great body of the traveling public are fully protected against a possible infection.

The steamers of the Plant line arrive at this port at 6 o'clock in the morning. They lie in the harbor, moored to a floating buoy, not anchoring directly until 1 o'clock the same day, when they sail for Key West. The five or six hours are spent in discharging by lighters the passengers, their luggage, and the limited amount of cargo, and receiving a like amount on board. The ships Mascotte and Olivette are as clean as constant work and untiring vigilance can make them. It speaks well for the care taken by Dr. Burgess, the representative of the United States Marine Hospital Service, and the officers of the line, when it is asserted that for 300 trips of the steamer Mascotte no case of contagious or infectious disease has been found aboard on arrival, nor has any person not complying with the regulations ever been permitted to land in the United States.

Havana should be a healthful city, and it would be but for the uncleanly habits of the citizens and the total neglect of sanitary laws, which make the name a synonym for the dreaded fever. Swept daily in three directions by the strong winds, and with a natural surface sloping to the water for all drainage, there is no natural condition why any infectious disease should obtain a foothold in a locality so highly favored; yet the daily health reports show the presence of from five to thirteen cases of yellow fever, besides the usual number of contagious diseases incident to a population of this size.

The reasons for this endemic character of the yellow fever are perfectly clear. Most of the sewers are badly built and serve to collect and retain the sewage rather than discharge it. Some few of the later ones, built under the Spanish engineer officers, are good specimens of the art and are serviceable, but the irregularities in plan, the worthlessness of material, and, above all, the rascality in construction of those built prior to recent regulations for new ones, make them death traps and worse. The fumes from almost all the manholes and catch basins in the older part of the city are as deadly as carbonic acid gas; and as it is now five months since rain has fallen, and there is no provision for flushing the sewers, the poison which flows steadily forth can be easily imagined. The outfall of these sewers is into the harbor, nearly all inside the line from Moro Castle across to the Casa Blanca.

This harbor is like a bottle, the neck or narrowest part being about five hundred feet wide and expanding into an area one by one mile and one half. There is no flow of tide of any consequence, the average rise being but two feet.

The sewage outflow falls directly into the still water under the wharves and there accumulates, and the harbor is gradually filling up with the concentrated extract of filth, which is death to disturb and sure disease to be in smell of. Vessels lying at the wharves lose their crews, and even when hauled into the stream carry with them the seeds of fever, to be propagated on board other craft which have had no communication with the shore. There are many singular examples of communicated contagion by air and wind related by the health officer of the Marine Hospital Service stationed here.

Another hardly less deadly source of disease is the filthy condition of the streets. The wind seems to be the only scavenger. In a residence of two weeks I have seen no attempt at cleaning the streets, and the condition of those about the markets surpasses belief. Under this hot sun vegetable matter begins to decay the instant it is cut. The supplies appear to be brought in from the country in the crude form, with no attempt to prune away the surplus and useless stalks, and the result is a mountain of rotten refuse thrown out at the nearest door or window.

The sanitary organization of the city is incomplete and inefficient. There appears to be no chief head or responsible authority with power to make and enforce necessary regulations.

There are too many officials. Each ward has its own alcalde or mayor, with a board of councilmen and staff equipment. All these are subject to the captain-general, but the endless circumlocution and detail of official redtape defeat any attempt to grasp the subject as a whole. There are many highly educated and advanced thinkers in all departments of science and the professions, men who keep abreast of the advance of sanitary progress in theory, but none who seem confident and competent enough to put theory into action. Hence the special branches which these men devote themselves to flourish, while the general health and education retrograde.

The real reason for the low standard of public health is said to be that the Spanish government is in constant financial straits, and has not the money for the sanitation of the city. The city is practically bankrupt. The paper money in circulation is worth only two and one-half dollars for one of gold, and the people are taxed to the utmost limit to maintain life. But this question of finance is aside from my purpose and cannot be here discussed. The facts are simply these: Here is a city situated in one of the most healthful localities in the world, a hotbed of infectious diseases and a plague spot for all its neighbors! Of this the people of the United States have repeatedly had sad experience, and as recently as only two years ago. It remains for us to so protect ourselves, if possible, that by no chance shall it ever again happen that we shall go through a like experience. FRANCIS.

Havana, Cuba, April 1, 1890.

Nitro-Glycerine in Doses.

The other day a representative of the *Star* newspaper met Dr. H. H. Burchard, one of the clever and famous physicians of Philadelphia. In speaking of the progress of medical science in these later years he said:

"Have you any idea of how far high explosives are used in medicine? You cannot get your knowledge from books unless you ransack five hundred volumes and pick up the scattered items here and there. It may surprise you to know that they are in daily use and of the greatest value in all sorts of diseases and injuries.

"There is, for example, guncotton, or, as we call it, pyroxylin. It is twice as powerful as gunpowder, but very much inferior to dynamite or nitro-glycerine. Dissolved in ether, it makes that wonderful compound we call collodion. In this shape it is employed to protect raw or injured surfaces. It dries rapidly—in fact, almost as fast as it is employed—and leaves behind a fine, elastic artificial skin, which is air and water proof against microbes and disease germs. Mixed with cantharides, collodion makes the best blistering plaster known to science. Mixed with tannin or tannic acid, it makes a wonderful remedy for stopping the flow of blood from wounds. In cases of scalding and burning, collodion enables the profession to cover the exposed flesh in a manner never before possible. No secretion of the human body affects it, nor, on the other hand, does it exert any unpleasant or objectionable influence upon the system.

"But of even greater value is nitro-glycerine. When used in medicine it is largely diluted, one part being mixed with one hundred parts of alcohol, and one drop of the resultant mixture is a dose. In this form it is an admirable antidote in cases of neuralgia of the heart and many cases of nervous disturbances of the human body. Thus it has been used and given wonderful relief in nervous asthma, hiccoughs, headaches, and similar disorders. It has repeatedly cut short an attack of the chills and fever, and so eminent an authority as Dr. Robert Bartholow recommends it in certain forms of Bright's disease, and also for that most miserable of earthly ailments, sea sickness.

"Thus far we have only begun to know the medical virtues of guncotton, nitro-glycerine, and amyl-nitride. Beyond these there are over six high explosives of which we know little or nothing as to their real character, and nothing at all regarding their action upon the physical organization. It does seem curious, however, that substances which in large quantities are destructive of life and property, should, in small ones, be beneficial to the sick and injured. The guncotton which blows a man up enables the physician to destroy the pain of his raw members and to heal them in less time than was ever before possible with other remedies."

Varnish for Confectionery.

Take half a pound or more of gum benzoine, put it into a bottle and cover it with fourth proof alcohol, cork up tightly and let it digest for at least two weeks, shaking up once or twice a day. After which time you may pour gently off any quantity you may require for present use. It should be the thickness of thin sirup; if used too thick, it is apt to appear in streaks on the work when dry; if too thick, dilute it with alcohol. This varnish is perfectly harmless and very fragrant, resembling somewhat the odor of vanilla. It will also keep for years, growing better with age. It is a nice varnish for all kinds of chocolate work and candies; pulled and clear. It forms, when dry, a thin, glossy film or skin over them, which prevents the access of the moisture of the surrounding atmosphere, and tends to keep them from becoming sticky for a much longer period of time.—*British Confectioner.*

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NEW ELEVATED RAILWAY.

In all city streets where there are two surface railway tracks there is a space between them of little use except for direct crossing. To utilize this space is the object of the elevated railway illustrated on this page.

It carries two tracks, supported upon a single line of columns. Taken in combination with street tracks below, it practically solves the question of rapid transit. The upper cars move at high speed, make few stops, and carry people quickly to long distances.

The lower cars move more slowly, stop often, and take local travel chiefly. Long distance passengers can ride on the surface cars to the nearest elevated station and then take an express train.

The drawings will explain the construction. It is not designed to carry locomotives or such cars as are used on the elevated railways of New York and Brooklyn, but cars not much heavier than street cars, drawn by electrical or cable power.

Single columns, placed between the surface tracks at distances of about 80 feet apart, carry triangular girders, to whose sides are riveted brackets, carrying the tracks, which are made purposely without cross ties and very open, so as to obstruct light and air as little as possible.

These brackets are extended above the tracks and carry longitudinal timbers which form safety guards, entirely preventing cars from falling to the street in case of derailment; which itself is not liable to occur, as the usual guard timbers are placed on each side of the rails.

The only question that can arise is whether the unbalanced weight of one car or one train of cars, with wind pressure added, can be resisted by a single post. To do this only requires that the post should be stiff enough not to bend, and the foundation large enough not to upset. With the light rolling stock proposed, this is not difficult.

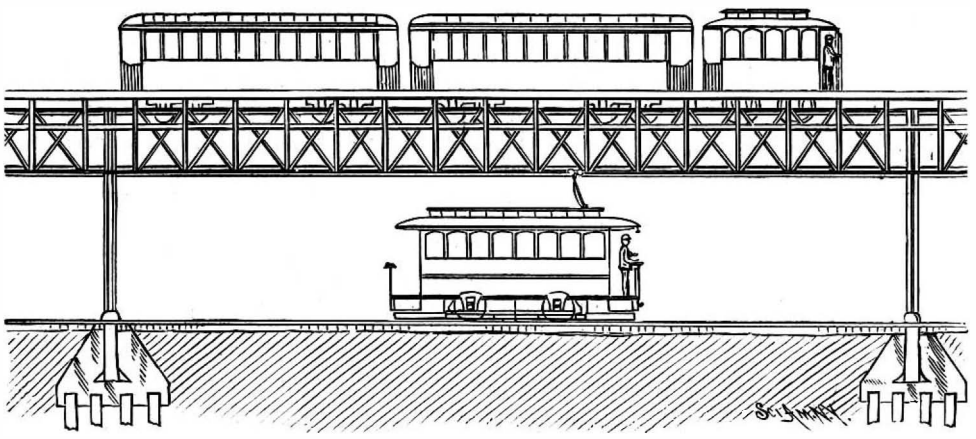
The column is embedded in a block of concrete during its construction. This block is all below ground, and can be made as large as necessary. Both calculation and actual experiment show that this is entirely practicable.

The clear space left between street cars is about 28 inches, and an 18 inch wide post can be set between, leaving 5 inches of clearance. This would require wire guards to be placed over the windows and along the inner side of platform, as is done on most cable roads. This is the only change necessary.

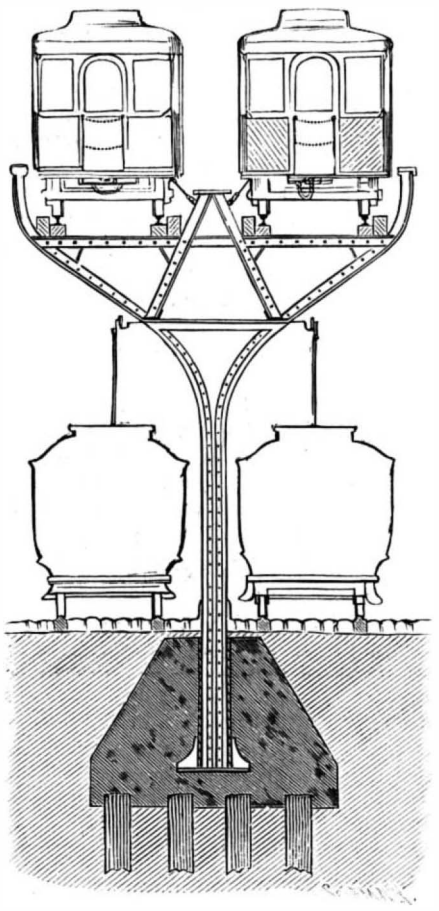
If the street cars use overhead electric wires, this structure can support them at every five feet if required, and in a position where they cannot be broken or cross other wires.

If the cars above use electric motors, the direct wires can be placed in safe position, and a return wire will keep the current from the structure.

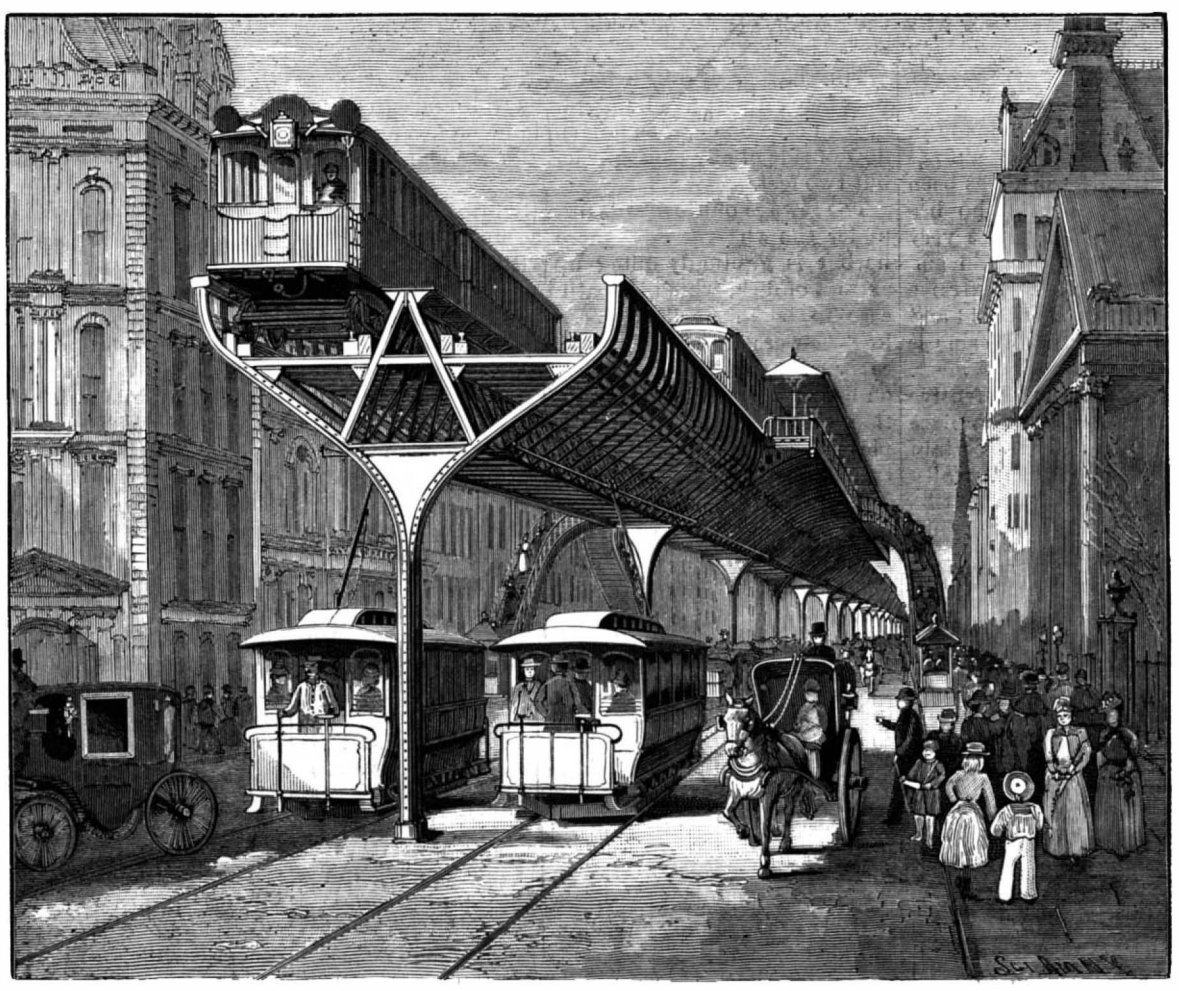
The advantages of this elevated railway, as claimed by the inventor, are: It more than doubles the capacity of existing street lines. It has a graceful appearance and gives the least possible obstruction to light and air. It gives perfect safety in operation. It carries electric wires in safety. It can be built for less than any other form of elevated railway. The inventor, T. C. Clarke, consulting engineer, 1 Broadway, New York, will give estimates of cost and other information.



DETAIL ELEVATION OF CLARKE RAILROAD SYSTEM.



CROSS SECTION SHOWING ELECTRIC CONNECTIONS.



THE CLARKE ELEVATED AND SURFACE RAILROAD SYSTEM.

Wire and its Uses.

Inventive genius is constantly finding new uses for wire, and we are quite justified in anticipating that it will be found that in 1890 we had advanced but a little way beyond the threshold in ascertaining its adaptability. Tensile strength and flexibility are qualities that fit it for a great variety of uses, and when we add that it is comparatively fireproof, we have another important property in extending its usefulness. By new processes of manufacture wire can be cold-rolled to almost any degree of fineness from inch rods and at greatly reduced cost, thus increasing its cheapness and at the same time its strength in resisting longitudinal strain. Who would have anticipated, a comparatively few years ago, the creation of a new industry in the manufacture of barbed wire for fencing, which continues to flourish in spite of its many detractors? For electrical purposes alone the use of wire, already so extensive, is certain to be a rapidly increasing quantity. The telegraphs of the world are now said to exceed 500,000 miles, but with the rapid growth of applied electricity for lighting and the distribution of power, even the enormous quantity of wire required for the maintenance and natural extension of telegraph systems would be but a fraction of that needed in the whole field of electrical industry.

Then to what diverse and almost contradictory purposes do we find wire applied in modern times. Experiments in the strengthening of heavy ordnance by wrapping wire while under tension around the steel cylinder are being conducted with reasonable prospect of success, and, if successful, will add to the efficiency of an instrument of destruction, while from the same mill may come the wire which, woven into the form of a mattress, may bear the weight of some unhappy creature struck down by that wire gun of modern warfare. It is woven into door mats, which are rapidly gaining in popularity by reason of their cleanliness, and this has led to the employment of woven wire as floor covering in other respects, notably in railway carriages, in hallways, and elsewhere where many feet pass. For such homelier purposes we may confidently look for a larger extension of its use, and in ways which we do not anticipate at present. Its advantage over fibrous material, in not retaining the dirt falling upon it, must suggest its employment in many ways where now the former is used.

Two very modern uses of wire which are widely different in their ultimate objects, but closely allied in the means employed to fit the wire for those diverse objects, may be mentioned. One is its use as a roofing material, and the other as the foundation for stage scenery. In both cases its lightness, durability, and safety from fire are elements of distinct advantage. In the one case the meshes are coarse, and in the other very fine, but in each the meshes are filled with a preparation which adheres firmly, making a continuous surface without crack or seam. For the roof, this preparation may be semi-transparent to admit light, or opaque, but for the scenery body it is made opaque, to prevent being seen through. The wire body thus prepared is the ground upon which the scene painter lays on the colors for the gorgeous spectacle, the beautiful glade, or the interiors which charm the playgoer. It is almost as flexible as canvas, and should greatly decrease the peril of fires in theaters; its use would certainly lessen the awful swiftness with which a theater fire started sweeps through the tinder of the flimsy wings and flies.

Yet another most recent use of wire, which has been exemplified at some of the latest exhibitions in London, is in the construction of collapsing into a very small fraction of its original bulk for return as an "empty." The strength, durability, and convenience of this contrivance should insure it a welcome and an extensive use. We have by no means exhausted the modern uses of wire. Braided or woven it is made into belts for driving the very machinery which produces it. It forms a material part of the dynamo that lights the factory, and it carries the directing voice of the manager from his office to the men who stand at the ponderous rolls and take the product from their jaws. It is used to stiffen the garments we wear, to support the flowers and tiny birds on the hats of women, to cage our singing birds, for the blanks of screws and nails, and, in short, for innumerable purposes we cannot mention here and now.—*Ironmongery, London.*

A PINT of warm water taken on an empty stomach in the morning is the safest and surest of all remedies for habitual constipation. It dissolves the fecal matter and stimulates peristaltic action, thereby giving a normal action without pain. If tongue is coated, squeeze a lemon into the water and drink without sweetening.

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ELECTRIC LIGHTING FOR AMATEURS.

It is now possible for any one to procure small incandescent lamps from the Edison Lamp Co. and from most dealers in electrical goods. The prices run as follows: ½, 1, 2, 3, 4, and 6 candle lamps, one dollar each. These little lamps can be operated quite successfully by means of easily constructed batteries. It is, of course, a little troublesome, and the expense of the electric light produced in this way is somewhat greater than other lights, but amateurs can derive a great deal of satisfaction from these experiments in electric lighting.

The battery may be made at home, from materials

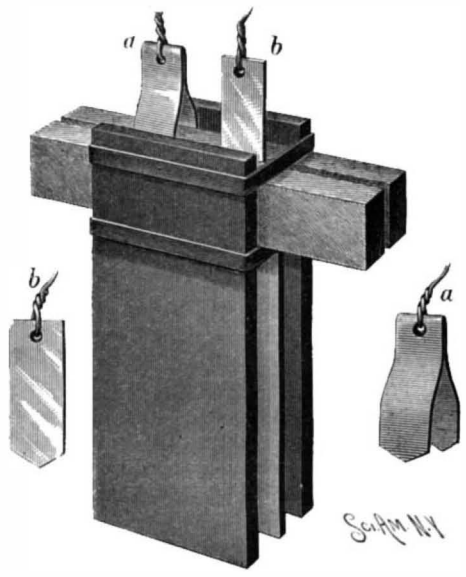

Fig. 1.—ARRANGEMENT OF CARBON AND ZINC PLATES.

that may be purchased from the manufacturers of the lamps or from any dealer in electrical supplies. Each cell of battery consists of two plates of carbon 2 in. wide, 4½ in. long, and ⅛ in. thick, one zinc plate 2 in. wide, 4 in. long, and ⅛ in. thick, two strips of wood ½ in. wide, ¼ in. thick, and 4 in. long, two strong rubber bands, and an ordinary tumbler.

The zinc is amalgamated by dipping it in dilute sulphuric acid (acid one part, water twelve parts), then sprinkling on a few small drops of mercury, rubbing it about with a swab formed of a piece of cotton cloth tied around the end of a stick. Every portion of the surface of the zinc should be covered with mercury. If the amalgamation is perfect, it need not be repeated.

The carbon plates before use should each be heated at one end and saturated with paraffine for a distance of 1¼ in. from the upper end (and no more) to prevent the solution from ascending the plate by capillarity. This is accomplished by heating the end of the plate over a lamp and applying a piece of paraffine or a paraffine candle until it is filled. No free paraffine should be allowed to remain on the surface of the carbon, as it will interfere with making a good electrical connection with the plate.

The zinc plate is placed between the two wooden strips. The carbon plates are placed outside of the strips and held by the two rubber bands, as shown in Fig. 1.

The connection between the carbon plates and the wire leading away from the carbon pole is made by a doubled strip, *a*, of copper, the ends of which are inserted between the wooden strips and the carbon

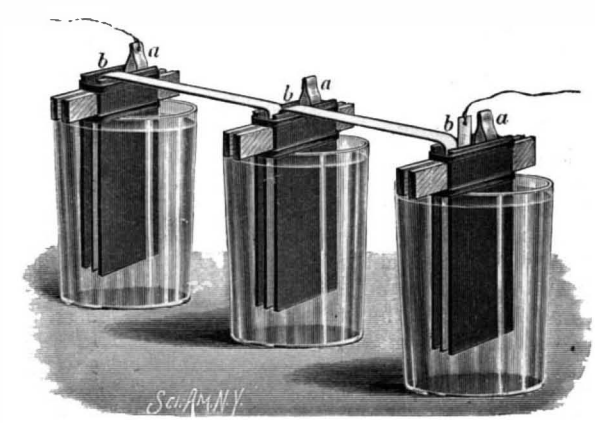

Fig. 2.—THREE CELLS IN SERIES.

plates. In a similar way a copper strip, *b*, is inserted between the zinc plate and one of the wooden strips. The tumbler forming the battery jar should be deep enough to allow the wooden strips to rest upon its rim, so as to support the plates a short distance from the bottom of the tumbler.

The ordinary bichromate of potash solution is used in the battery. It is prepared by making a saturated solution of common bichromate of potash in warm water, then, after cooling, adding very slowly a quantity of common sulphuric acid, equal to about one-fifth of the bulk of the bichromate solution. It is advisable to add to the solution a very small quantity of bisulphate of mercury, say one-eighth ounce to the quart of solution, to maintain the amalgamation of the zinc.

The salts known as the C. & C. battery compound are excellent and very convenient for use in batteries of this class. It is only necessary to dissolve this compound in water to form the exciting solution.

This material is sold in tin cans containing two or three pounds. It absorbs moisture rapidly, so that when it is to be used in small quantities, it should be transferred to a stoppered glass jar.

It is, perhaps, needless to say that great care should be exercised in handling the solution, as it is poisonous and destructive to clothing, carpets, etc. The same remark applies to the battery compound.

One cell of this battery should be allowed for each candle power of the lamp. The zinc of one cell should be connected with the carbon of the next, as shown in Fig. 2. The battery may be arranged as a plunger. Directions for making a battery of this kind were given on page 116, of volume 57, of this journal.

In Fig. 3 is shown a convenient bracket for supporting small electric lamps. It consists of two curved wires attached to a small piece of board by means of screws which also serve as binding screws for attaching the wires. The lamp is suspended from eyes formed in the ends of the wires. This device may be used as a standard, as shown at 1, as a hanger, as shown at 2, or as a bracket, as at 3.

In Fig. 4 is shown a series of three small lamps connected with three cells of battery.

The lamps in this case are connected in parallel or multiple arc, *i. e.*, one binding screw of each lamp is connected with one wire from the battery. The other binding screws of the lamps are all connected with the remaining pole of the battery.

Copper wire, No. 18 or larger, should be used for making the connections. The battery will run continuously with a single charge of the solution for about three hours. Should the solution become warm and give off hydrogen, the zinc should be reamalgamated at the points where it is violently attacked.

How to Prevent the Spontaneous Ignition of Coal in Ships.

In a paper recently read in London before the Institution of Naval Architects, Professor Vivian B. Lewes advocated the ejection of compressed carbonic acid gas, and explained his plan as follows:

If carbonic acid gas is compressed under a pressure of 36 atmospheres at a temperature of 32° Fah., it is condensed to the liquid state, and can be obtained in steel vessels, closed with screw valves. On opening the valve, some of the liquid is ejected into the air, and on coming down to the ordinary atmospheric pressure, is in a moment converted into a large volume of gas. Conversion from the liquid to the gaseous state means the absorption of a large amount of heat, and so great is this, that everything near the stream of new-born gas is cooled down, and some of the escaping liquid is frozen to a solid having a temperature of —108·4° Fah. (—78° C.). I should suggest its use in the following way for the checking of ignition in the coal cargo:

The nozzle attached to the screw valve on the bottle of condensed gas would have a short metal nose piece screwed on to it, the tube in which would be cast in solid, with an alloy of tin, lead, bismuth, and cadmium which could be so made as to melt at exactly 200° Fah. (93° C.). The valve would then be opened, and the steel bottle buried in the coal during the process of loading. The temperature at which the fusible metal plug would melt is well above the temperature which could be reached by any legitimate cause, and would mean that active heating was going on in the coal. Under these conditions, the pressure in the steel cylinder would have reached something like 1,700 pounds, and the moment the plug melted, the whole contents of the bottle would be blown out of it into the surrounding coal, producing a large zone of intense cold, and cooling the whole of the surrounding mass to a comparatively low temperature. The action, moreover, would not stop here, as the cold, heavy gas would remain for some time in contact with the coal—diffusion taking place but slowly through the small exit pipe.

When coal has absorbed as much oxygen as it can, it still retains the power of taking in a considerable volume of carbonic acid gas, and when coal has heated and then been rapidly quenched, the amount of gas so absorbed is very large indeed, and the inert gas so taken up remains in the pores of the coal, and prevents any further tendency to heating. Indeed, a coal which has once heated, if only to a slight degree, and has then cooled down, is perfectly harmless, and will not heat a second time. It is not by any means necessary to replace the whole of the air in the interstices of the coal with the gas, as a long series of experiments show that 60 per cent of carbonic acid gas prevents the ignition of the most pyrophoric substances. A hundred cubic feet of gas can be condensed in the liquid state in a steel cylinder 1 foot long and 3 inches in diameter, and it has been shown that a ton of coal contains air spaces equal to about 12 cubic feet. One of these cylinders would therefore have to be put in for every 8 tons of coal, and these would be distributed evenly through the cargo, and near the alarm thermometers, which would be set to ring a degree or two below the point at which the fusible plug would melt. The bell ringing in the captain's room would warn him heating was taking place, and the bell would continue to ring until the cylinder had discharged its contents and had cooled down to a safe degree, so that the whole arrangement would be purely automatic, and yet the officers would know if everything was safe. If the precautions advocated were taken, no danger could arise until the arrival of the ship at her destination, and the commonest precautions would then suffice.

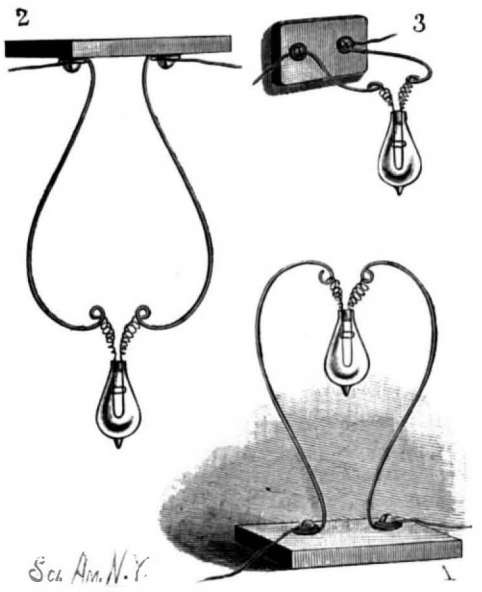

Fig. 3.—LAMP SUPPORT.

In conclusion, Professor Lewes remarked that the question of preventing the heating and ignition of stores of coal on land and ready for use in bunkers could not be met so well by the use of the liquid gas, and in these cases it would be found beneficial to dress the coals with a little tar or tar oil, which would close the pores, and to a great extent prevent oxidation. He believed this was advocated by Lachman about 1870. Crude petroleum in small quantities for this purpose would also be found valuable, for it had no tendency to oxidize itself, and lowered the tendency in other bodies, besides coating them and so preventing access of oxygen.

The Plate Glass Industry.

The manufacture of plate glass is evidently one of the most prosperous industries in the United States to-day. But whether it will continue to be such, in view of the large increase of capacity projected, is a question which time alone can determine. There are already eight great works in operation, viz.: Crystal City, Duquesne, Creighton, Tarentum, Ford City, New Albany, Kokomo, and Butler, capable of making from 9,000,000 to 10,000,000 square feet of glass per annum, according to recent estimates, or almost as much as the present requirements of the country call for. What then is to become of the heavy additional production promised is not known, without lower prices for the article can greatly augment consumption. But the work on new plants and additions to old ones is going on just the same, nevertheless. At Charleroi, the newest industrial city of Pennsylvania, a huge plate glass establishment is being erected, and

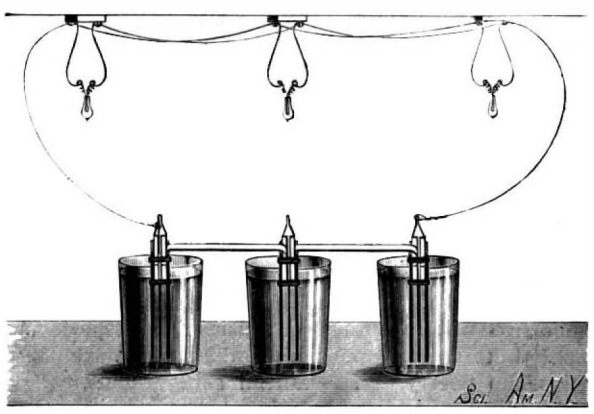

Fig. 4.—LAMPS CONNECTED IN PARALLEL.

will be equipped with glass machinery by the Ranken & Fritsch Foundry and Machine Company, of St. Louis, at a contract cost of $308,000. The Diamond Plate Glass Company, of Kokomo, Ind., through a branch $2,000,000 incorporation, is putting up a works at Elwood, Ind., to make 20,000 feet of finished glass a day and give employment to about 2,500 men. The Pittsburg Plate Glass Company purpose doubling their present plant at Ford City, at an outlay of $1,750,000, so as to surpass all competitors in the matter of output, at home or abroad. Other companies still are enlarging, and entirely new enterprises of the kind are being either actually organized or talked of in various parts of the country.—*Age of Steel*.

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The Care of House Plumbing.

It is not all of life to live, nor all of plumbing to plumb. Simply to live is to fail in all the purposes of life. So the simple fact that a residence has been plumbed does not eternally secure the sanitary drainage of a house. This work, however perfect when placed, may in time get out of order and need repair. The settling of a building may break a joint or otherwise cause defects in the drainage which no foresight of the best plumber in the country could prevent. Decay is written on the face of everything, and plumbing work forms no exception and should receive the best of care, for its perfection is of the highest importance to health. In regard to its care a writer in the *Sanitary Era* points out the importance of efficient care of plumbing and suggests two annual tests of the safety of the drainage. The water test, as suggested, would probably be disastrous to carpets, etc., in some instances and could be replaced by other tests. The *Sanitary News* agrees with the *Sanitary Era* on the importance of inspection, but suggests that it would be to the interest of the householder to have a qualified plumber to do the work. Nooks and corners, fixtures and exposed pipes can be kept clean by any one, but a proper inspection of the plumbing work can best be made by a plumber. The writer referred to says:

"The disease-breeding dangers of house drainage require of the occupant accommodated with water carriage of waste a well instructed and perpetual vigilance. The best plumbing is liable to deterioration from a variety of causes, like everything else, and the worst needs no comment, except that there is enough of it to make expert examination of the system from top to bottom before buying, accepting, or hiring a house, the plainest dictate of prudence. Not only at the beginning, but at least once a year ever after, all the pipes and joints should be tested for leaks by plugging up the mouth of the house sewer or drain, and filling the whole system with water by the ventilating pipe at the roof. Leaks, if any exist, will then manifest themselves by the gradual lowering of the water at the top of the filled ventilator pipe, and will locate themselves by wetting the premises—which should be at all points open to inspection for this purpose. If in that case no leak should appear within the house, and yet the test water should lower, the defect is in the drain, which will rapidly create a pestilent condition in the soil near the house if not remedied. Obstructions, however, may possibly frustrate the water test, or the peppermint test, and this should be guarded against by particular tests from floor to floor. If the pipes are free, the pouring of a little oil of peppermint into the ventilating pipe gives a very delicate test of leaks by its strong escaping odor. But as this may not be definite enough as to the locality, the house cat may be employed as a detective, by using instead the oil of valerian or 'catnip,' which the creature's nose will locate infallibly if the least aroma of her favorite perfume transpires through the joints.

"Constant attention to the nooks and corners about and within the pipes and fixtures is even more necessary to cleanliness and health than in all other parts of the house, and nothing of that sort should be boxed up out of sight. The traps should be occasionally examined, especially after continued disuse, to see that they are full of water at all times, and free from other deposits. The safes, or drip pans, under basins and water closets, as well as the interior of the latter, should be regularly cleaned, and the waste or soil pipes should be dosed with strong lye to clear out the tenacious slime that adheres to their sides.

"But in the proper sanitary care of the house drainage there is great help to be had from the most improved fixtures. This is a subject well worth thorough study by every householder."

The Inventor of To-day.

A writer in the Boston *Herald* says: If there is any man to whom the term "self-made" will most truly apply, it is the inventor. He must possess three general characteristics peculiar to all men who achieve success in life, but in more full development than most others, to wit, ingenuity, enthusiasm, and perseverance. Like the true poet, his soul is in his work; but his is the poetry of substantial achievement, which gives wealth, as well as happiness, to mankind. If it be desired to harness the forces of nature for human benefit, the inventor devises the harness in the shape of machinery to operate with. Every comfort which we enjoy in civilization bears the sign manual of the inventor's skill. Our clothing, furniture, the houses we live in, our means of travel, the carriages and ships we own and employ, the books and papers we use, even the luxuries we can command, are all largely due—at least their best utility and excellence are—to the genius of the inventor.

The first success of the inventor, no matter how insignificant it may be, is usually the first step in a new life of the most absorbing interest to himself, and satisfaction also; but it is likewise the first step in the treadmill of unceasing effort and thought—a treadmill that never stops for him while life remains. Go where he will, he cannot escape its operation. Every piece of machinery he sees suggests something to his busy brain, and, in fact, everything that he observes suggests an improving device to him. But it is rarely or never plain sailing with him in anything he undertakes. One of the things that troubles him a great deal is the improvements he is all the time making of his own work; and often, when he has secured a patent on some machine, his mind has so far advanced in improved devices for it that what he has secured is practically valueless to him.

One of the main things for an inventor to learn in the invention of machinery is to have in every machine as few parts as possible, to make them direct-acting, and have the machine or thing, as a whole, easily operated. Mr. Edison once said that very many of the most meritorious inventions that were ever made were not successful, because it required some skill and brainwork to operate them. "To make a success of a thing," he added, "you must have it so simple and easy of operation that a mule can operate it. Then you have a thing that will come into general use, if it is presented to the world in a business way."

The newer fields of invention are most promising for the young inventor. One of these is electricity. The best inventions in this field have mostly been made in the last fifteen years—largely, indeed, inside of the past decade. Here the field is opening out and widening all the time, as new applications of the electric current or electric energy are being constantly discovered. Already the inventors in this field can be counted by the hundred, and there are, perhaps, more successful ones among them—that is, the ratio is greater than in any other field of invention. Just for a moment look at the prospect here presented. In the electric current we have an element of power that is more easily controlled and handled, more easily diffused over large areas, more adaptable to a greater variety of purposes, than any other of the forces of nature within our control. It will heat our houses, do our cooking, furnish us with light, and convey power anywhere that we may desire it to, and in any proportion we may call for. This covers a wide range of application, but it by no means exhausts the uses and purposes to which electricity can be applied, and this field, it will be seen, is therefore a most promising one to the young inventor.

Mat Manufacture in Cochin.

The following account of the history and manufacture of Wadakaucherry mats has recently been given in a report on the Agricultural and Industrial Exhibition held at Mysore in October of last year.

The mats are made at Wadakaucherry, a taluk of Cochin. They are known at the place by the simple name of grass mats, and are recognized elsewhere by the name of Palghat and Kavalapasa mats, other places of manufacture. The industry was introduced into Cochin from Kavalapasa about forty years ago. At first there was but one family engaged in the trade; it has now increased to three, consisting in all of twenty souls. Both males and females are employed in the work. The men were originally brought for making mats from the Sircar, and were provided with free quarters. Such is the short history of the introduction of the industry into Cochin.

These mats are made, like the Palghat mats, of a kind of sedge (*Cyperus Pangorei*) grown by the side of swamps and rivers. The sedges grow to a height of six feet by one and a half inches in circumference, and are of a triangular shape. They are collected in the rainy season. The culms or stems are split, and the inside pith removed, and are then dried. Each stem may be split into from four to eight, or even twelve, according to the delicacy of the texture intended. The strips are then well seasoned and sewn into mats. Women are mostly employed in the collection and splitting of the stems, while the actual weaving is done by men. The loom used for the purpose is of simple construction, consisting of two bamboo pieces at either end, attached to pegs driven in the ground. The warp consists of twine made of country hemp, and is produced by the weavers themselves. In special cases cotton thread is also used instead of twine. The process of weaving is done by the strips of sedge being passed to and fro crosswise, by means of a stick with a hole at one end of it to which the sedge is attached. The warps are passed through a movable piece of wood with as many holes as there may be warps, and are tied up to the bamboo pieces at either end. According to the number and nearness of the warps, the greater is the delicacy and strength of the texture. The woof is made compact by means of the piece of wood above described.

The distinguishing peculiarity of the Wadakaucherry mats is their brilliant color. Only four varieties of it can, however, be had, namely, the white, black, red, and yellow; of these the last is the readiest to fade, and is obtained from a peculiar solution of turmeric and cassia leaves. White is the natural color of the strips when properly prepared, red is obtained by boiling the strips in water containing sappan wood and cassia leaves, black is but a conversion of red by a peculiar process of boiling the red strips in a solution of gall nuts and green vitriol, and by subsequent soaking in a preparation of black clay. The difficult and dextrous portion of the work is the splitting and dyeing of the strips; the same have to be colored with different colors, and this has to be done very carefully with reference to the size of ornamental work intended to be produced. When one color is being worked at, the rest of the strip which has to be colored differently will be closely covered with the outer covering of the plantain tree. The process of drying and dyeing the strips may take a fortnight.

Natives use the mats as seats, and also for mattresses in the hot weather. A sort of social distinction is associated in the offer of these mats as seats, and among the vulgar, disregard of it on ceremonial occasions tends to foment disputes. These mats are also used for flooring, and are then woven to the size of large halls and rooms. The mats vary in price from 1 to 10 annas, while the superior kinds fetch from 15 to 25 rupees, according to quality.

Experiments have been made with other colors besides those just mentioned, but hitherto without success. If the industry were carried on by organized capitalists, these experiments might perhaps be successfully repeated, and many other improvements effected, such as facilitating the splitting of the sedge and keeping it compact by means of mechanical aid, and also relieving the weavers from the stooping they have always to assume when engaged in the work.

The mats of Wadakaucherry, compared with those of Tinnevelly, are generally superior in color and ornamental work, but are less pliable, though the strips are sometimes more delicate.

Endurance of the Odor of Musk.

Many marvelous accounts are related in works on pharmacy and organic chemistry, with regard to the extraordinary duration of the scent of musk, and the extremely small loss of substance which a grain or two of this substance, exposed to the air, has been found to undergo in the course of several months, or even years. But an instance of this endurance of the musk odor has come under our personal observation in the following manner. In 1850, at Brussels, three small volumes were presented to us. They were bound in red cloth, and inclosed in a green cardboard case. In this case a very minute quantity of musk mixture, from a sachet, was placed in order to scent the volumes. Since the year 1850, these three little red volumes, in their green cardboard case, have been constantly exposed to the air, on the shelves of a library, as well as to daylight. They have been in constant, almost daily use (for they are standard works of reference), and they have traveled with the writer to Ostend, to Paris, to Frankfort, to Scotland, to the South of England, to various seaside resorts, to London, and many other places; yet, at the present moment, after a period of forty years, and being exposed to many kinds of climates, these little books retain their odor of musk, which is as powerful, especially on warm days, as it was in 1850 when the volumes were received.

A new invention by Messrs. E. Schnauffer and H. Hupfel, of Frankfort, for the manufacture of a substitute for musk, is an imitation of the old method of making artificial musk by treating oil of amber with nitric acid; only the authors above named use other hydrocarbons, namely, benzene, toluene, or xylene, which also belong to the aromatic series. But these are first converted into isopropyl, isobutyl, or isoamyl derivatives, and then nitrated. The products of this reaction are thrown into water, whereupon a reddish brown oil separates; this is washed several times with alkaline water to withdraw all residue of nitric acid. In the concentrated condition this oil has a sweet odor, and when diluted in alcohol it gives off a penetrating, enduring odor of musk. Here is an example of the operation in question with xylene. Metaxylene, as it is called, is heated with isobenzyl, alcohol, and chloride of zinc, under pressure, and the resulting compound, known as dimethylisopropylbenzene, subsequently treated with nitric acid yields the oil $C_{12}H_{17}NO_2$, which is the musk odor in question. For perfumery purposes it would be used in the form of a dilute alcoholic solution.—*Monthly Magazine.*

GEORGE W. CARTER, who discovered natural gas in Indiana, and to whose pluck and energy its success in that State is due, recently died at Eaton, Ind., from paralysis. Several years ago, at Muncie, he sunk a well several hundred feet deep, on the banks of the Mississinewa River, after coal, which was supposed to be there. On striking the Trenton rock, the gas odor frightened away the diggers, who did not know what it was that they had found. The well was filled up and the coal search abandoned, no one knowing the usefulness of the new discovery. When gas was found at Findlay, Mr. Carter was one of the passengers on an excursion train run over to see the wonder. He found the great new fuel to be nothing more than what he had abandoned. He went home and sunk a well where he had filled the one up before, and got the first gusher in Indiana. There is now talk of erecting him a monument.

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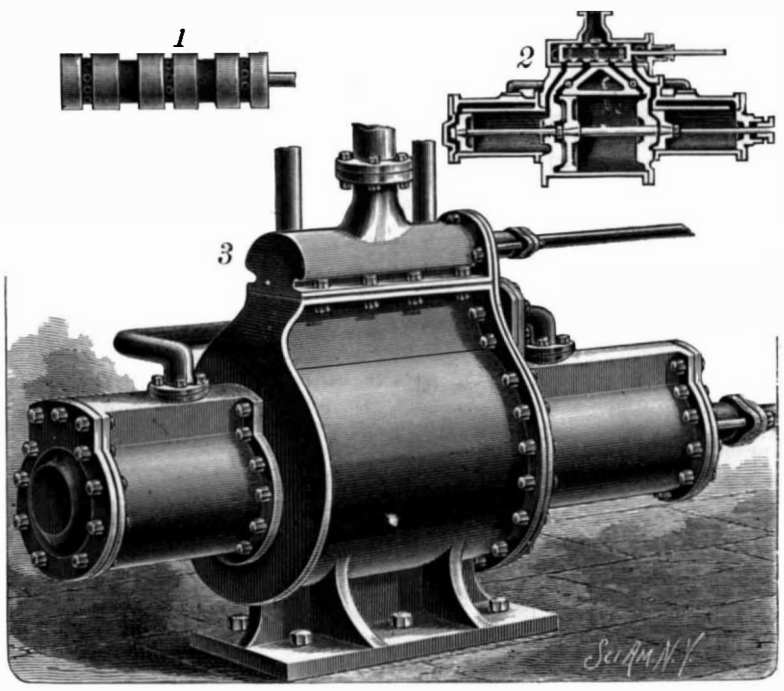
AN IMPROVED COMPOUND ENGINE.

The engine herewith illustrated has been patented by Mr. John Riekie, of Saharanpur, India. It has two high pressure cylinders, and between them a low pressure cylinder, all in line with each other, and their pistons secured to a common piston rod connected in the usual way with the driving shaft. Into the inner ends of the high pressure cylinders as shown in Fig. 2, lead live steam ports opening into the ends of the steam chest, which is preferably of cylindrical form, and contains a hollow cylindrical valve, shown in Fig. 1, connected with a valve rod operated in the usual manner from the main shaft. Into the ends of the steam chest lead pipes connected with the boiler, and from the top of the steam chest in the middle extends the exhaust pipe, channels therefrom leading to the interior. The steam chest is also connected near its middle by ports with the ends of the low pressure cylinder, and from these ports lead pipes connected with ports leading to the outer ends of the high pressure cylinders. In the periphery of the cylindrical valve are annular grooves connected with the interior of the valve, and grooves adapted to register with the ports connected with the ends of the low pressure cylinder and with branches of the exhaust pipe. With this construction the boiler pressure of the steam does duty for one stroke in the high pressure cylinder, after which this cylinder is converted into a steam chamber on the return stroke of the piston while the steam is doing a second duty, expanding in another cylinder. In this way equal power is exerted on the crank arms at all stages of expansion, compounding being done on each crank separately.

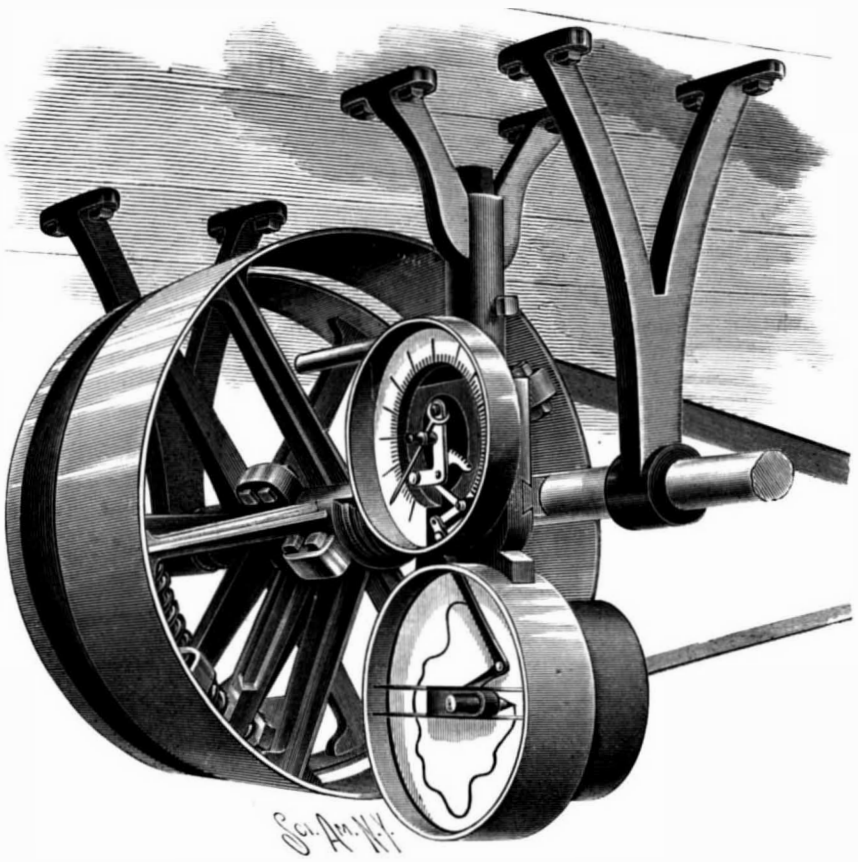


RIEKIE'S COMPOUND ENGINE.

AN IMPROVED DYNAMOMETER.

A power indicator and recorder designed to accurately measure or weigh the power necessary to operate a machine or a number of machines driven from the same shaft, and automatically record the amount, is shown in the accompanying illustration, and has been patented by Mr. Emery Nixon, of Toronto, Ontario, Canada. The driving pulley is mounted to turn loosely on the driving shaft, and is turned by a pin engaging one of its spokes, the pin being secured near the outer end of one arm of a two-part bar made to loosely clamp the hub of a wheel secured on the driving shaft. The end of the other arm of the bar is held to slide on a segmental guide bar secured in lugs on the inside rim of the wheel, there being on this guide bar a coiled spring, one end of which presses against the arm and the other against the lug farthest from it. In the hub of the two-part bar is a spiral groove, into which fits a pin secured on a dovetailed bar fitted to slide in a groove in the hub of the wheel, the bar extending parallel with the driving shaft, and having on its outer end a lug engaging an annular groove in a ring held concentric with the shaft, and provided with a bar which operates the indicator, suitably mounted in proximity thereto. The bar operating the indicator is pivotally connected by a link with a segmental gear wheel in the indicator casing, this gear wheel operating a pointer which travels over a dial. The indicator-operating bar is also pivotally connected by a link with one end of a lever operating the registering device, provided with a pencil adapted to mark on a graduated card. With this construction all the power used to run the driving pulley is communicated through the dynamometer, one arm of the two-part bar pressing against the spring on the inside of the rim of the wheel fixed on the driving shaft, with a force proportionate to the amount of power used, and, by means of the connections through the spiral groove of the hub with the indicator and recorder, the load carried by the driving shaft is regularly measured and recorded.

For further information relative to this invention address Mr. Spencer Love, No. 10½ Adelaide Street East, Toronto, Ontario, Canada.



NIXON'S POWER INDICATOR AND RECORDER.

WINDOW plants may be grown any season of the year in the following manner: Soak a large piece of coarse sponge in water, squeeze half dry, and sprinkle in the openings red clover seed, millet, barley, grass, rice, and oats. Hang it in the window where the sun shines a portion of the day, and sprinkle daily with water. It will soon form a mass of living green where even the clover will bloom.

Difficulties Encountered in Statistical Work.

Francis A. Walker, President of the Massachusetts Technological Institute, on the study of statistics in colleges and technical schools, says:

Those who have never tried their hand at statistical work will fail to appreciate the difficulties to be encountered at the start, and the frequently recurring need of going back and beginning all over again. To go to a series of extended tables with multitudinous subdivisions, in which a given total is distributed among many classes, and to take therefrom just what you want, no more, no less, and no other, to make sure that your parts when put together will form a whole, and that no direction conveyed by the heading of a single column has been neglected, is a task for which men must be trained, and in which they must be practiced, going from simple and easy examples to complex and difficult ones, by patient steps. The great majority of editors and writers for the press, the great majority of legislators and public speakers, either fail on such work, or, as is most likely, judiciously avoid the attempt, even though statistical matter altogether relevant to the subject, and which might be made most interesting to their readers or hearers, lies on every side of them. The learned president illustrates the power a real master of statistics wields over his hearers as follows: Attend a meeting where Mr. David Wells is speaking, and see how he holds the crowded audience in close attention for two hours, with no help from rhetoric, elocution, or gesticulation, merely by the strong, vivid, effective way in which he marshals figures. In my long experience in office at Washington, nothing struck me more forcibly than the helplessness of congressmen—even, with few exceptions, the acutest and best trained—to get up the figures for their own speeches. No matter how clear their conception of the positions they wished to present, few of them could readily and confidently resort to the government publications at hand for the statistical materials with which to illustrate and enforce their views; and the gratitude with which they would accept and acknowledge some trifling assistance from a well trained clerk was almost ludicrous. I do not intend any disparagement by this statement. Statistics have a language of their own, and he who would use them must first learn that language; and this is as yet taught scarcely anywhere.

The Naval Fight of the Future.

Each vessel will clear for action as soon as the other is discerned—perhaps five miles away. Each will probably slow down at first, in order to gain time for preparation, and especially for getting the steam pressure up to the highest point. Forced draught will at once be started, and the subdued roar of the air driven through the furnaces, to accelerate combustion, and the whirr of the dynamos, will be added to the clang of the gun breech blocks, as they are swung open to admit the projectile to the breech, the hum of the ammunition hoists raising powder and shell to the decks, and the quiet, firm orders of authority. On deck the Gatling guns and revolving cannon, and the rapid-fire guns in the tops, are got noiselessly into readiness, the captain takes his place in the armored conning tower with the chief quartermaster and his aid, the executive officer assumes charge of the battery, and remains near at hand to take the captain's place in case of his death or disability, the range finders are got into position, and the officer in charge begins to report from time to time the distance of the enemy, now drawing closer.

Probably not a shot will be fired until this distance is reduced to 2,000 yards, and probably both ships will keep pointed toward each other until that time. But now what will the contestants do? It has been held that both will advance steadily toward each other—each commander hoping that some false move on the part of his adversary will enable him to rush forward, discharge his bow torpedo at 500 yards, and perhaps follow it up with his ram and end the fight at once—until they have approached so close, say 500 yards, that neither dares to swerve lest he himself be rammed, so that the ships will at length collide end on, and may be both sink!

The various inventions of the past few years, rapid-fire guns, high explosives, torpedoes, submarine boats, dynamite guns, and range finders, the increased power and perfection of steam and electric machinery, the improvements in powder and in steel for projectiles and for armor, have not revolutionized naval science so much as they have broadened it. The principles of strategy remain the same, and so does the necessity for the seaman's skill. Engineers construct, inventors invent, experiments are tried, sham battles are fought, and heated discussions agitate the naval mind, but the only thing that can determine the real conditions of modern naval warfare is a modern naval war.—*Lieut. Bradley A. Fiske in the Forum.*

Gunboats for Interior Africa.

The British government has recently intrusted Messrs. Yarrow & Co., of Poplar, with the construction of two steel shallow draught steamers to serve as gunboats, of special design, for the navigation of the Zambesi and Shire. These boats merit attention, owing to the novelty of their construction. They are of the stern-wheel type, 90 feet in length by 16 feet beam, and having a draught of from 18 inches to 2 feet, and are of about the same tonnage as the passenger steamers plying between London Bridge and Chelsea. They will be shipped in pieces and put together at their destination. The most remarkable feature of Messrs. Yarrow's contract is that they have undertaken to put them together at the mouth of the river and have them ready for steaming within 24 hours after arrival without going ashore or having any recourse to the land on either side of the river. At the same works there are being built, side by side with the English boats, six boats for the Portuguese government, for service in the same district. These were contracted for immediately after the recent expedition up the Zambesi in three steamers, also built by Messrs. Yarrow, of which Major Serpa Pinto was in command. The Portuguese will, therefore, before long, have a small fleet, consisting of nine gunboats, on the Zambesi.

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RECENTLY PATENTED INVENTIONS.

Engineering.

EXHAUST NOZZLE.—Lewis P. Garner, Ashland, Pa. This is a device specially adapted for locomotive engines, and is designed to govern the exhaust by increasing or diminishing the outlet, while it may also be made to produce back pressure on the piston in the cylinder when it is desired to brake the engine.

MANUFACTURE OF WATER GAS.—Charles E. Burdell, New York City. This invention is for an apparatus in which superheated steam and oil are injected into an incandescent mass of anthracite coal, decomposing the superheated steam and combining the oil vapor to form oil and water gas, the apparatus being designed to effect a saving in fuel, time and labor, and afford a gas having but a small portion of deleterious matter.

Railway Appliances.

GRIP FOR CARS.—Jacob M. Isenberg, Mines, Pa. Combined with a governor and a latch actuated thereby is a cradle pivoted at one end of the car and terminating in hooks or claws, the cradle being adapted for engagement by the latch, the device being designed for use with the cars of inclined roads, and acting automatically when the speed of the car is increased, as by the breaking of a cable, to clamp the ties of the track.

TRUSSING FOR CARS. — Ferdinand E. Canda, New York City. This invention provides for dividing the length of the car between the body bolsters into four or more panels by the addition of one or more cross sills and necessary supporting struts, the auxiliary sills, struts and truss rods being placed below the floor level to allow of supporting the central portions of the car without obstructing the floor space.

LABEL HOLDER FOR FREIGHT CARS.—Martin Williams, St. Johnsville, N. Y. This is a frame for card labels with an adjustable support journaled to rock on the frame and release the card, displaying the destination, or for a similar use, to avoid nailing such cards on the side of the car, the device holding the card or label until it is designedly removed.

Miscellaneous.

VALVE.—Patrick Conway, New York City. In this valve the packing washer is made to bear against the smooth surface of the seat in the upper part of the bonnet, whereby the packing will wear a long time and allow no steam to escape around the stem, the valve being simple and positive and also applicable for other uses than with steam.

STRAW BURNING STOVE. — John R. Tacey and John Sharkey, Winnipeg, Manitoba, Canada. In this stove the fuel chamber is disposed laterally to the fire box, and connected therewith through a gravity cut-off damper, projections on the doors being adapted to push the fuel block. The stove is designed to burn past the gravity damper.

DRESS STEEL. — Mary E. Whalen, New York City. This steel has tabs on its outer side adjacent to its ends carrying rings, providing for the attachment of such steels to dress linings, so that there will be a flexible connection between the steels and the lining, and the elastic retaining bands will not cut at the point of connection with the steels.

AXLE NUT. — Ole Hansen, Mount Pleasant, Utah Ter. This nut is formed with a projecting flange and thread extending from the flange to the inner face of the nut, with other novel features, designed to give any desired amount of play to the wheel upon the axle, and to facilitate taking up the wear of the axle without the use of the ordinary washer.

HARNESS SADDLE.—Marcellus M. Hitt, Sheffield, Ala. This invention provides a detachable and adjustable tug strap loop adapted to clamp the skirts of the saddle, and also provides a shield attachment to the loop designed to effectually prevent the snap chafing the skirts.

TRACE CARRIER. — John S. Brown, Galveston, Texas. This is an improved back band buckle with hooks, its body portion formed of a single piece of wrought wire, the meeting edges being properly bent for the purpose, and the tongues pivoted upon the body portion, forming a cheap construction of great strength.

HOODWINK. — Amaziah B. Grubb, Goose Lake, Iowa. This is a device particularly adapted for use on vicious horned cattle, to hinder their attempts to gore other cattle and persons, and prevent their throwing or jumping fences, the shape being such as to allow free access of air and light laterally to the animal's eyes, and permit free vision save in front.

HOSE COUPLING. — Robert Franken, Pomona, Cal. This invention provides a novel design and arrangement of parts designed to simplify the construction, while providing a coupling which may be readily coupled and uncoupled, and which will effectively hold the coupling sections against accidental displacement.

ASSORTING MACHINE. — Samuel B. Smallwood, Long Island City, N. Y. This is a machine for conveniently and automatically assorting pickles and other articles, the invention covering various novel features and details of a machine with which the operator does not touch the pickles directly with the hand, and they are not injured in the process of assorting.

FENCE.—William G. Frost, Lebanon, Ind. This invention covers novel features in a fence made of posts, wire stringers, braces, and pickets, and designed to be inexpensive and durable, easily erected, moved, or repaired, while making a good barrier against stock and not likely to injure them.

FLOWER POT TRELLIS. — John S. Brown, Galveston, Texas. This trellis consists of vertical wires having the loops and horizontal wires bent into the form of rings with lapped and adjustable ends to increase or diminish the size of the trellis, being adapted to be applied to flower pots of various sizes to support plants or vines without interfering with their roots.

PUZZLE. — Wofford Brown, Parkersburg, West Va. Combined with a movable board are pins arranged thereon to form end triangles at diametrically opposite corners, other triangles being placed centrally thereto, while there are single corner pins, and removable balls or objects are to be made to enter the different triangles as the board is held at different angles.

WIND WHEEL.—Asa W. Chamberlin, Stratford, Iowa. In this wheel the fans have upper and lower halves with rear projections and connected by an edge rod having a stop hinged on the fan arm, there being governor balls to attach to the arms by which the wheel may be gauged so that it cannot run above a certain speed, even if the work be light, and the usual vane being dispensed with.

CENTRIFUGAL CREAM SEPARATOR.—Carl A. Hult, Denver, Col., and Oscar W. Hult, New York City. In this separator the milk is supplied from a can to a spreader chamber below and thence to an inner receptacle capable of being rapidly revolved, whereby the milk is thrown in contact with the walls of the receptacle, and escapes by an outer channel, while the cream, being lighter, collects around the shaft and passes out thence through an undercut recess.

NEW BOOKS AND PUBLICATIONS.

GEMS AND FOREIGN STONES OF NORTH AMERICA. By George Frederick Kunz. The Scientific Publishing Company, New York. 1890. Large 8vo. Pp. 336. Price $10.

This superb work is worthy of a high place in the literature of the subject. Its author has been for years gem expert for Tiffany & Co., New York City. He is also special agent of the United States Geological Survey and of the 11th United States census, member of the Mineralogical Survey of Great Britain and Ireland, and of the Imperial Mineralogical Society of St. Petersburg, the Society Francaise de Mineralogie, etc. The book is not only a thorough treatise upon this subject, but it is a work of art as regards both printing and illustrations. It contains eight very fine colored plates and numerous other illustrations. A chapter is devoted to pearls and remarkable foreign gems owned in the United States.

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MAY NUMBER.—(No. 55.)

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2. Colored view of a residence at St. George, Staten Island, N. Y. Estimated cost $20,000. Floor plans, perspective elevation, sheet of details, etc.
3. Stone residence, corner of St. Nicholas Place and 150th Street, New York city. S. Burrage Reed, architect.
4. New buildings at Eastgate and Bridge Streets, Chester.
5. Engravings of the residence of J. M. Johnson, Binghamton, N. Y. Perspective elevations and floor plans. Cost $19,000 complete.
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7. An English cottage. Perspective and floor plans.
8. A cottage recently erected at Binghamton, N. Y., cost complete $3,800. Plans and perspective.
9. A residence in the Gothic style erected at New Brighton, S. I. Floor plans and perspective.
10. Excellent design of a country house recently erected at Belle Haven, Conn. Cost $14,250. Oscar S. Teale of New York, architect. Perspective views and floor plans.
11. A double dwelling at Yonkers, N. Y., erected at a coss of $8,000. Plans and perspective.
12. Residence of Chas. Kappes, Esq., at Stapleton, Staten Island, N. Y. Cost complete $4,000. Perspective elevation and floor plans.
13. Cottage at Greenwich, Conn., erected at a cost of $7,250 complete. Floor plans and perspective.
14. Miscellaneous Contents: High buildings. — Bad flues.—Imitation ebony.—Destruction of asphalt pavement by gas.—Art of building.—Improved dumb waiters, illustrated.—An improved skylight, illustrated.—Rogers miter planer, illustrated.—Dumb waiters and hand power elevators.—A fine window in the Convent of the Sacred Heart, illustrated.—Improved sash pulleys, illustrated.—A hot air and hot water heater, illustrated.—Colors for mortar.—Improved adjustable grooving head, illustrated.—An improved window screen frame, illustrated.

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Notes & Queries

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Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(2160) H. C. S. asks: What method is employed to write on glass under water, by electricity? Is there a solution of chemicals used to put in the water? A. The plate to be etched is put into a flat vessel connected with the positive pole of a secondary battery. The plate is covered with a saturated solution of saltpeter, and is then written upon with the negative electrode, which is provided with an insulating handle.

(2161) M. G. H.—The sugar maple could not be confounded with any other species indigenous to your place. It is a large, handsome tree, with 3 to 5 lobed leaves with rounded sinuses and heart-shaped at the base. The common red or swamp maple is a smaller tree, and has reddish twigs. Sugar exists in the sap of all the maples.

(2162) N. S. asks: 1. Can you give a recipe for a dip on silver that will give it a good black color, one that will give it a brown color like bronze medals? A. Use sulphide of sodium dissolved in water. To intensify the black, dip and wash metal in a solution of nitrate of mercury before immersing in the sulphide solution. 2. Can you tell me a good recipe for making a neutral silver solution? A. Dissolve in nitric acid, evaporate to dryness, and fuse at a low heat.

(2163) E. A. E. asks: What is the best treatment to give the front doors of my house? They are about three years old, and painted in imitation of black walnut. The weather has made the paint run a little, and streaked, like so many veins, running in all directions. A. There is no good remedy except to burn off the old paint and repaint the wood.

(2164) A. E. H. writes: 1. I want to have a lamp to read by, and I want it to be an incandescent electric lamp of about 8 candle power; could you tell me the cheapest primary battery to work, for lamp of this size? I am writing this letter by a ½ candle power (Edison's) 3 volt lamp by two small Bunsen cells (porous cup 3¾×2), and it is giving about 1 candle power, by which I can see very well to write without any other lamp, but this way of illumination is of course very expensive. I use about 25 cents' worth of nitric acid every time I use these two small Bunsens, which is too expensive. A. A simple plunge battery would be less expensive than the Bunsen, but it would run the lamp only two or three hours without recharging. We shall soon publish a description of a battery suitable for small lamps. 2. Would accumulators be efficient for a small lamp as mentioned above? A. Accumulators would run the lamp. 3. Is there a cheap way of making and using them? A. There is no very simple and cheap way of making and charging accumulators. 4. What is the advantage of charging accumulators in different directions at first? A. To secure a deeply oxidized surface. 5. Could I use a 1 horse power water engine if I were to get the 8 light dynamo described in SUPPLEMENT, No. 600? A. A 1 horse power engine will drive the 8 light dynamo. 6. Could I run the water engine by the ordinary pressure in a house? A. Yes. 7. Would it cost much to wind the field and armature if I bought the castings? A. The wire would probably cost $4 or $5. 8. Do you think that this dynamo could be run in an ordinary house with the ordinary water pressure? If so, would it be efficient? I mean not from a strictly practical point of view, but for using in a laboratory for comparatively strong currents. A. The pressure would be sufficient, provided the service pipe is large enough to keep up the supply. 9. How many Bunsen cells (ordinary size) would be required to run an electric motor of 1 man power? A. 8 or 10. 10. Is there a cheap way of making the metal aluminum? A. There is no very cheap process for making aluminum.

(2165) E. S. B. asks: 1. In making an induction coil such as described in SUPPLEMENT, No. 160, can I use No. 36 silk-covered wire and wind close together instead of using bare wire and leaving a space between each wire as I wind it? Would I get as good results by doing it the first way? A. The silk-covered wire will answer every purpose. 2. Will a secondary current ring an electric bell? A. It will ring a bell provided with a polarized magnet wound with very fine wire. 3. Can the dynamo described in SUPPLEMENT, No. 161, after being changed into a motor be run by battery power? If so, how many cells will it take? A. Yes. It will require four or five large cells of plunging battery, with plates 6×8 inches. 4. Would one cell of Leclanche battery run a small 2 inch induction coil? A. Yes; provided the primary wire has sufficient length. 5. Where can I find a description of a lightning arrester? A. In any elementary work on electricity or on telegraphy. 6. I have taken a very thin wooden spool, five inches long, and wound on it two layers of No. 16 cotton-covered wire, and after placing in the inside a bundle of soft iron wire and passing the current from two Leclanche cells, I cannot magnetize the iron, even when the current is passing through the coil. What is the trouble? A. Your primary wire is too large and too short for Leclanche cells; try a Grenet bichromate cell. For Leclanche cells you should use 2 layers of No. 24 wire in the primary coil. 7. Please give me the numbers of all of your papers containing descriptions of the Blake transmitter. A. SUPPLEMENT, No. 250, contains a description of the Blake transmitter. 8. In the Blake transmitter can some other metal be used in the place of the platinum button? A. Platinum is preferable; copper or carbon will answer for temporary use.

(2166) L. A. C. asks: 1. How is the insulating covering wound and braided on magnet and other insulated wires? A. By special machinery. 2. *a.* What is ebonite? *b.* What is vulcanite? *c.* What is vulcanized rubber? A. Vulcanized India rubber, exposed to high pressure in the process. 3. When power is transmitted electrically over a distance of several miles, is the strength of current very greatly diminished by the resistance of the conducting wires? A. It depends on the resistance of the wire, and on its relation to the resistance of other parts of the circuit. As a general rule, it is largely reduced. 4. Are permanent magnets used in any part of a dynamo, and if so where? A. The field of a dynamo retains a little residual magnetism, but in the sense of your question there is no permanent magnet. 5. What can be mixed with whitewash to prevent it from being washed off by the rain? A. See query 977 for government receipt for whitewash. 6. What are the principal electrical schools in this country, and where are they? What is your opinion as to the best way in which to get an electrical education? A. All the leading universities give courses now. A college course followed by practical work is the way to learn the science. 7. How can a person obtain information concerning the educational and physical requirements necessary to enter West Point? Also concerning the appointments? A. Address the superintendent. For appointments address your congressional representative. 8. In what way can a compass needle be made to point in a north and south direction after it has been partly demagnetized by the action of a strong horseshoe magnet which has lain near the compass? A. Hold the south pole of a strong magnet as near to the north pole of the needle as possible. This will improve it often if you cannot take it out of the case. 9. Is there a book published which is a dictionary of electrical and mechanical terms? If so, what is its name? A. Houston's "Electrical Dictionary," $2.50, is an excellent work, which we can supply by mail.

(2167) W. H. S. writes: The definition of the term dielectric in Houston's dictionary is a substance which permits induction to take place through its mass, and it says further that all dielectrics are nonconductors. Now, unfortunately, Houston has omitted the definition of the term induction in his dictionary. My impression is that induction through a mass is conduction through of an electric current; consequently I cannot reconcile the apparently opposite definition. A. Induction is a property of electric currents, and refers to their power of forming a field of force in space. Every current develops lines of force in the space sur-

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rounding it, and if these lines pass through a dielectric, no current is created by them, and their existence is revealed by a polarized needle, etc. Your impression is a wrong one.

(2168) E. V. N. asks: 1. Has the storage battery proved a success as a motor in aerial navigation, bicycling, carriages, etc.? A. No; it is too heavy. 2. What is the weight of such an apparatus compared with the power developed in horse power? A. A cell weighing 125 pounds gives energy at the rate of 70 watts, equal to a little over one-eleventh horse power. 3. Where can data on the subject be had? A. The companies dealing in and making accumulators will supply data of different sized cells. 4. What is the weight of a gas meter compared with the power produced in horse power? A. A 1 horse power gas engine will weigh about 1,000 lb.; the large will weigh less in proportion. 5. What is the consumption of gas per horse power? A. From 25 cubic feet upward. 6. What is the usage in determining the amount of storage necessary in a storage battery to develop a given power for a given length of time? A. Practical considerations affecting the duration of the plates are the basis.

(2169) G. J. L. writes: I would like to make a lotion such as the dermatologists use in removing freckles or tan.

A. White soft soap.....3 oz.
Gum mucilage thick and clear.....4 "
Finest pale honey.....6 "

Mix thoroughly in a mortar, add the yolks of 5 eggs previously beaten and strained through gauze, add slowly oil of almonds (scented to taste) 2¼ pounds. When perfectly mixed add pistachio milk (made from freshpeeled nuts and rose water) ¼ pint, and rub up until completely mixed. This is corrosive, and acts by removing the outer cuticle.

(2170) A. P. F. writes: Will you state the ingredients, with their proportion, for forming a pickle commonly used in preserving cucumbers, mixed pickles, etc.? A. Put, after washing and drying, into boiling vinegar, add some salt, a handful to a three gallon jar, let cool. Boil up the vinegar alone every third day, and pour on the pickles until the cucumbers turn green, then add ginger and pepper to suit the taste.

(2171) A. M. G.—The plant sent for name is the common liver leaf—*Hepatica triloba.*

TO INVENTORS.

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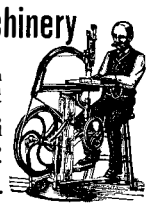

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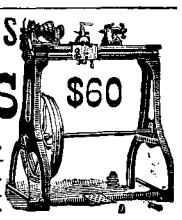

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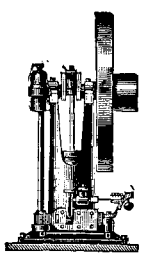

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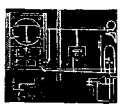

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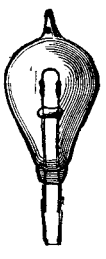

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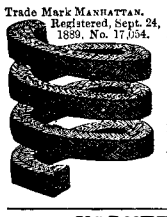

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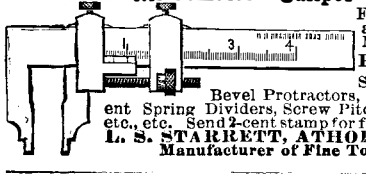

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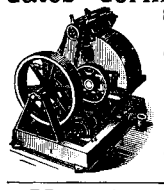

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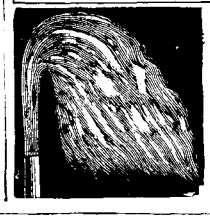

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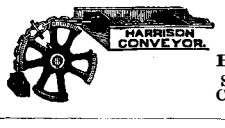

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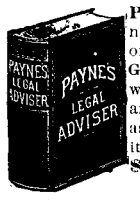

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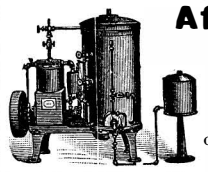

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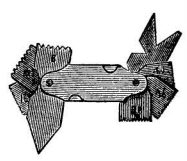

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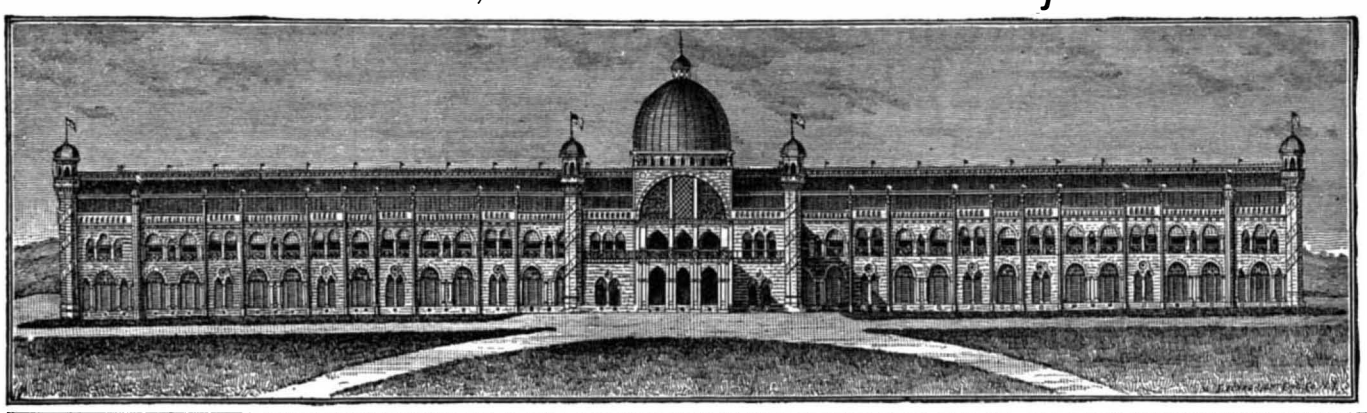

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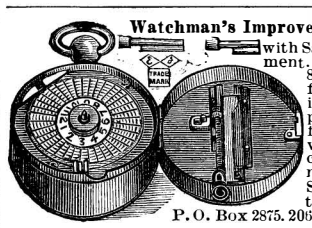

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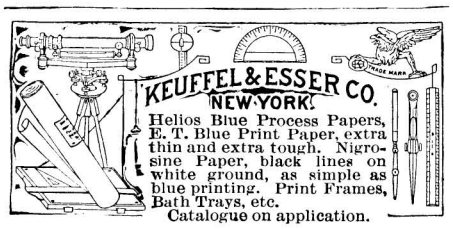

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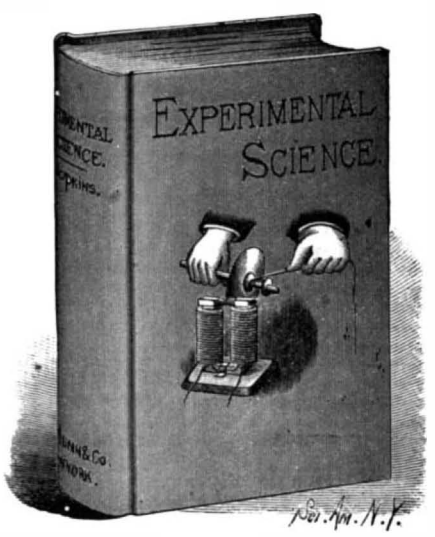

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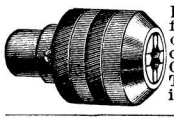

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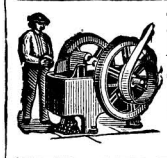

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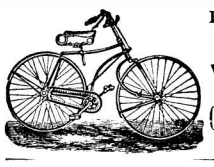

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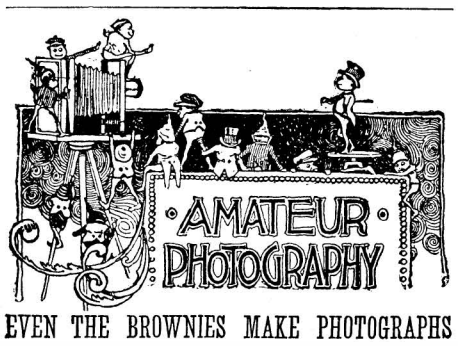

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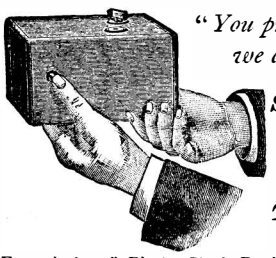

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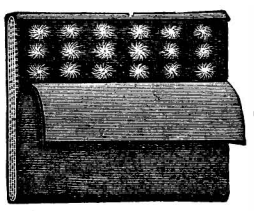

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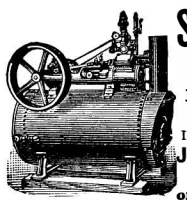

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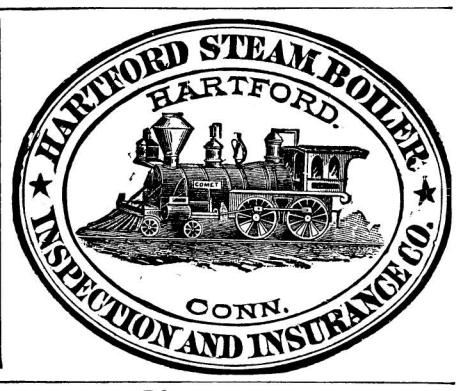

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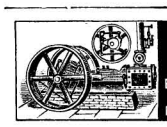

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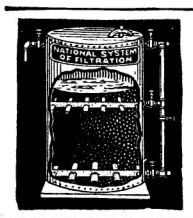

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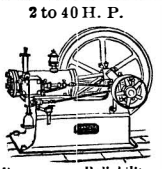

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